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VIEWS, NEWS AND INTERVIEWS.

The Institution of Electrical Engineers, of London, has just issued a revised list of its officers and members corrected to June 30, 1896. The total membership is 2,674, made up as follows: Honorary members, 2; foreign members, 183; members, 599; associates, 1,606; students, 284.

An old story is again going the rounds in modern dress. It is to the effect that a gentleman was walking along a street where a trolley line had recently been built. He came upon a party of lunatics out for an airing in charge of a keeper. Addressing one of the insane men, he said: "Where does this railway go to?"

"It doesn't go anywhere," the lunatic replied. "We keep it here to run trolley cars on."

A number of electrical manufacturing plants were compelled to shut down last week, owing to the excessive heat making it impossible for the employés to work.

A bewildered-looking farmer stood in the center of Haymarket square looking at the trolley wire, says a Lewiston, Me., paper.

The electric car came along and slowed up. They rang the bell and shouted at him and ordered him to move. He still kept looking at the wire and making inarticulate sounds with his lips.

"Get off the earth, you Jersey calf!" shouted the motorman.

The old man was fairly bumped by the slow moving car before he moved.

Then he jumped up and said: "I did it, by thunder! Where's my money?"

He looked around cautiously, and then he said: "You seen a red-faced feller with a white mustache waxed? I want him. He bet me $5 I couldn't look at that ere wire three minutes and count 200. I've done it."

"Did you put up the money?"

"Sure," was the reply.

"Dingdong!" went the bell.

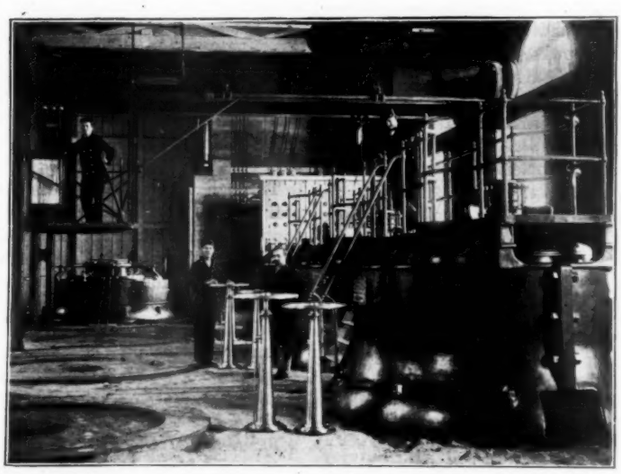
Electric-lighted signs promise to play an important part in the present political campaign. There is one up already for McKinley and Hobart in front of the State Club in New York city. It is a glowing success.

The tower man in the signal house of the Long Island Railroad at Laurel Hill, L. I., had an unpleasant experience last week. He was found unconscious in the tower by trainmen who climbed up to see why the signals were set against them. Investigation showed that several men employed on an electric light line some distance away had permitted a live wire to cross the wires that led to the signal tower. The telegraph instrument was burned out. The tower man suffered no serious inconvenience from the shock.

The Gold and Stock Telegraph Company, of New York city, reports the death of three of its employés during the heated term last week. An inspector, a lineman and a collector were fatally prostrated by the heat.

The Roentgen rays have successfully proved the sanity of a man in Hamburg, Germany. He declared 10 years ago that he had a bullet in his head which he had fired into it in trying to commit suicide. He complained of the pain, and as he attacked his keepers, and the doctors could find no trace of a wound, was locked up as a dangerous lunatic. The Roentgen rays have now shown the exact location of the bullet in his head.

At a recent fire in the basement of the power house of the Chicago City Railway Company the firemen had great trouble in getting at the blaze. They had to chop holes in the floor of the dynamo room before they could get a stream on the blazing pile of waste. Not waiting for the dynamos to be shut down, they crept through the black smoke and turned a stream on the flames. In an instant they were flung to the ground with great violence, and the hose was sent flying into the air. A heavy current had passed along the stream and had shocked them. Though unconscious when rescued, they quickly recovered.



Interior View of "Station B," Portland, Ore., General Electric Company's Transmission Plant.—(See page 88.)

A company has been formed at Ojebro, Sweden, for the purpose of purchasing four waterfalls in the neighborhood, the power of which it is proposed to use for electric lighting of the towns of Vadstena and Skeinige, and for the working of some mills.

EDISON ILLUMINATING COMPANIES.

Seventeenth Convention of the Association at the Oriental Hotel, Manhattan Beach, L. I.

A GOOD ATTENDANCE OF BRIGHT MEN OF THE ELECTRIC LIGHTING FIELD —UP-TO-DATE PAPERS ARE ANIMATEDLY DISCUSSED—IN INTEREST AND INSTRUCTION THE CONVENTION PROVES TO BE ONE OF THE BEST EVER HELD—MR. S. INSULL, OF CHICAGO, ELECTED PRESIDENT, AND MR. W. S. BARSTOW, OF BROOKLYN, RE-ELECTED SECRETARY — REPORT OF PROCEEDINGS, ENTERTAINMENT, TRIP TO SCHENECTADY.

The extremely hot weather of the past three weeks was not sufficient to discourage the electric light man nor daunt his enthusiasm. Every session of the seventeenth convention of the Association of the Edison Illuminating Companies at Manhattan Beach last week was well attended. Tuesday and Wednesday were devoted to the hearing of committee reports and the reading of papers and the exhaustive and expert discussion of them. There is an earnestness and alertness about these representatives of the earliest work in electric lighting that is particularly noticeable, and the papers presented and the discussion they evoked were most emphatic proof that members of this association are as full of progressive ideas and determination as when many of them, years ago, started on what was then an unknown and unexplored industry. Now, while all this is changed, and while the best practice governing the supplying of electric light and power is generally well known, there are many refinements to be considered and suggested changes to act upon.

It is to discuss these advancements

and the desire to keep fully abreast of the electric times that brought together at the popular Oriental Hotel last week members of the association from Chicago and Boston, Detroit and Atlanta, and many other distant points. The presence of Mr. Edison, who left his laboratory to spend two days at the convention and greet his many old and new friends, was an evidence of his appreciation of the work they were doing that greatly pleased every member, and was an inspiration for renewed effort.

The Brooklyn Edison Company, as the host of the occasion, made pleasant provision for the entertainment of the attendants and their ladies, and the fireworks, Sousa's band, Rice's "Evangeline," and other interesting features of Coney Island were placed at the command of all with the compliments of the Brooklyn company. On Wednesday a trolley party was participated in by the ladies under the special care of President Doty of the company.

The first session was called to order by the president, Mr. C. L. Edgar, at 11 A. M., August 11, and was devoted to the reports of committees on Welsbach light, storage battery, etc. The meeting adjourned at 1 P. M.

The second session was called to order at 2.30 P. M., and a paper was read by Mr. C. E. Pattison, of Boston, on "The Storage Battery in Actual Operation in the Boston Edison Stations." This paper gave the experience of the Boston Edison Company since the installation of its first battery several years ago, and the data as to the depreciation, maintenance, etc., was clearly stated. This paper was fully discussed by several members of companies using storage batteries.

The next paper was by W. I. Donshea and H. A. Campbell, entitled, "A Storage Battery in the New York Edison Stations." This paper gave the history of the battery in the stations of the Edison Electric Illuminating Company of New York from the time of Crompton-Howell type in the Fifty-third street station down to the present time. This paper, as its predecessor, was fully discussed and favorable results commented upon.

The third session was called to order August 12, at 10 A. M., by President Edgar, and was opened by a paper by Alexander Dow on "The Selection of Alternating-Current Apparatus for a Central Lighting Station." This paper was immediately followed by one on the same line, entitled, "The Alternating-Current System as a Pioneer," by W. S. Barstow, of Brooklyn. Both papers were then discussed, and many representatives of Edison companies present gave their experience with alternating systems used in conjunction with the Edison system, and the Chicago and Cincinnati companies briefly outlined the work they were doing in this direction.

The fourth session was called to order at 2.30 P. M. Mr. R. S. Hale, of Boston, read a paper on the "Wright-Demand System of Charging for Current." This was followed by interesting discussion as to the results met with in a system of discounts, as outlined in a paper of the last convention. The Chicago, New York, Cincinnati, Brooklyn and several other companies gave their experience in the new system of charging for incandescent light.

A paper was then read by Mr. John Wolff, of Brooklyn, on "A Self-Cooling Condenser in the Second District Brooklyn Edison Station." This paper described the construction and operation, and gave a year's result in the apparatus in question. This paper was discussed by the Detroit and New York Edison companies.

The last paper of the convention was read by W. S. Andrews, of Schenectady, on "Some Recent Developments and Modifications of the Edison Underground System, and the Use of Cables as Auxiliaries Thereto." This paper provoked an animated discussion as to the merits of the several underground systems and the use of different makes of cables.

The treasurer's report was then read and accepted, pleasure being manifested at the splendid financial condition of the association and the good work of the treasurer.

The Committee on Nominations then made a report of the officers for the ensuing year, which report was accepted. These officers are: President, Samuel Insull; vice-president, R. R. Bowker; secretary, W. S. Barstow; treasurer, J. W. Lieb, Jr.

Executive Committee: C. L. Edgar, chairman, Alexander Dow, C. R. Stetson, A. W. Field, J. H. Vail. Ex-officio members: S. Insull, R. R. Bowker, W. S. Barstow, J. W. Lieb, Jr.

THE ATTENDANCE.

Thomas A. Edison, Llewellyn Park, Orange, N. J.; W. E. Gilmore, Edison Laboratory, Orange, N. J.

General Electric Company: S. D. Greene, general manager, lighting department; E. W. Rice, Jr., third vice-president; W. S. Andrews, manager, central station sales; A. D. Page, manager, lamp sales, incandescent lamp department; J. R. Lovejoy, manager, supply department; J. W. Howell, engineer, lamp works; W. S. Clark, wire and cable department; John Kruesi, mechanical engineer; Caryl D. Haskins, meter department.

Illuminating companies: Edison Electric Illuminating Company of Atlanta, Atlanta, Ga., H. T. Edgar, general manager; Jas. C. Rossman, electrician.

Edison Electric Illuminating Company of Boston, Boston, Mass., C. L. Edgar, vice-president and general manager; C. E. Pattison, R. S. Hale.

Edison Electric Illuminating Company of Brooklyn, Brooklyn, N. Y., W. S. Barstow, general superintendent; W. F. Wells, electrician; John Wolff, superintendent, steam plant; Theo. Cuillaudeu, chief engineer; C. V. Driggs, superintendent, underground department.

Chicago Edison Company, Chicago, Ill., Samuel Insull, president; Joseph Insull, Luther Stieringer.

Appleton Electric Light and Power Company, Appleton, Wisconsin, A. L. Smith, president.

Electric Light Company of Atlantic City, Camden, N. J., E. A. Armstrong, J. F. Burleigh.

The Cincinnati Edison Electric Company, Cincinnati, Ohio, John I. Beggs, vice-president and general manager.

The Cleveland Electric Illuminating Company, Cleveland, Ohio, Samuel Scovil, vice-president; Robert Lindsay, general superintendent.

The Columbus Edison Electric Light Company, Columbus, Ohio, A. W. Field, secretary and manager.

Edison Electric Illuminating Company of Cumberland, Md., Cumberland, Md., J. S. Crider.

Des Moines Edison Light Company, Des Moines, Iowa, J. A. Colby, treasurer and general manager.

The Edison Illuminating Company, Detroit, Mich., Alexander Dow, general manager; Hoyt Post, director; Henry Ford, chief engineer.

Elgin City Railway Company, Elgin, Ill., Chr. Wustenfeld, manager.

New Bedford Gas and Edison Light Company, New Bedford, Mass., G. R. Stetson, president; C. R. Price, treasurer.

The Edison Electric Illuminating Company of New York, New York, N. Y., R. R. Bowker, first vice-president; J. W. Lieb, Jr., general manager; W. I. Donshea, district superintendent; W. H. Lawrence, G. N. Moore, J. Van Vleck, Arthur Williams, E. A. Leslie.

The Edison Electric Light Company of Philadelphia, Philadelphia, Pa., W. H. Johnson, secretary and manager; J. H. Vail, engineer-in-chief.

Rochester Gas and Electric Company, Rochester, N. Y., G. A. Redman, general superintendent, electric department.

Wilmington City Electric Company, Wilmington, Del., Reginald Van Trump, A. E. Kennelly.

DELEGATES VISIT THE SCHENECTADY PLANT OF THE GENERAL ELECTRIC COMPANY.

Through the courtesy of the General Electric Company, the delegates to the convention of the Association of Edison Illuminating Companies at the Oriental Hotel were invited to visit the company's great manufacturing plant at Schenectady, N. Y., last Thursday. The invited guests left Manhattan Beach at 8 o'clock in the morning and arrived at the Grand Central Depot in New York city at 9.20. At 9.35 o'clock a special train, consisting of a locomotive, three handsome Wagner drawing-room cars and a swell Wagner dining car, started with the delegates for Schenectady. The New York Central & Hudson River Railroad Company provided the train and equipped it with a picked crew, who were remarkably attentive and polite in the discharge of their duties.

Breakfast, luncheon and dinner were served on the train, and the Wagner cuisine was of the highest order. Cooling beverages were supplied during the day *ad libitum*.

The journey up the Hudson River was very enjoyable, the smooth track giving a false impression of the high rate of speed at which the train traveled. Several stretches were covered at the rate of 68 miles an hour. A brief stop for water was made at Poughkeepsie. The train reached Schenectady about 1 o'clock in the afternoon.

The train was backed down on a Y to the gates of the General Electric Company's establishment, and the party, which consisted of 45 ladies and gentlemen, at once began their tour of inspection.

The party was divided up into groups, and each group was placed in charge of a competent guide.

One of the first sights to attract attention were two bicycle sheds, which the company has built to accommodate the bicycles used by its employés. There were over 400 bicycles stored in these sheds. There are 67 buildings comprised in this immense plant, where everything electrical, except meters and incandescent lamps, is manufactured from raw material. Although work in the railway department is a little slack, owing to the lateness of the season, 3,300 employés were at work in the various buildings.

The shops and foundries are so grouped that the work passes from building to building in direct lines until it reaches the assembling department in the center of the plant. Adjacent to this is the shipping department, which is alongside the company's private railroad track. The finished product is loaded into freight cars from the door of the shipping room. A large shipment of electrical goods for Genoa, Italy, was being prepared while the visitors were there.

Miniature trolley roads run up and down the avenues between and into the various buildings. They are used to transport work from one department to another. Every building in which heavy work is done is equipped with one or two overhead electric cranes. Their actions in handling heavy weights seem almost human.

In one building the frame of a gigantic 1,500-kilowatt generator was being finished. In another the 30-ton electric locomotive exhibited at the World's Fair was being spruced up before delivery to the N. Y., N. H. & H. R. R., who will use it in their yard service for handling freight cars.

The porcelain factory is especially complete. Here were seen in process of making a large order of giant petticoat insulators for the transmission plant at Ogden, Utah. In the armature winding department are some especially ingenious devices for forming the coils of armatures. The skillful workmen turned out the coils with surprising rapidity.

All the machinery is run by electric motors located in each building. In the finishing department are several massive boring and drilling machines, which are portable. When it is desired to move them a chain is passed through an eyebolt in the upper part, they are picked up by the electric crane and set down in the exact position for the most advantageous work to be done.

A central power station supplies all the current used. Steam is generated by two batteries of Babcock & Wilcox boilers, and three triple-compound engines furnish a part of the power. The sheet-metal department, where

all the armature disks are cut, is run by two 30-horse-power induction motors, one placed on a shelf on each side of the building. Current to run these motors is supplied at 20,000 volts. The supply circuit is carried from step-up transformers for a considerable distance, thence to step-down transformers, where it is transformed to 230 volts and thence to the motors in the building. About 300 tons of sheet-iron are used each month for armature disks.

Away off in one corner of the grounds is the calibrating department, where instruments are tested. The company has its own fire department and one steam fire engine drawn by horses. The fire-alarm system is very complete.

An interesting diversion was afforded by Mr. Chas. P. Steinmetz, who gave some interesting high-voltage experiments for the benefit of the visitors. He caused a current of 150,000 volts and one ampere to jump an air gap of 14 inches. The leaping, writhing flame was veritable lightning in a miniature form. The surrounding air was charged with electricity to such an extent as to be felt. Some careless people forgot about this and ruined their watches.

After the tour of inspection cooling drinks were served in the company's offices, and at 6 P. M. the return journey was begun. The train reached the Grand Central station at 9.45 P. M. Mr. S. Dana Greene, manager of the General Electric Company's lighting department, was the host of the day, and managed the trip so that the comfort and pleasure of each individual was assured. Among the party were four of the most prominent representatives of the Edison illuminating companies in the country. They were Messrs. Samuel Insull, of Chicago; R. R. Bowker, of New York; W. S. Barstow, of Brooklyn, and John I. Beggs, of Cincinnati.

PERSONAL MENTION.

Mr. S. Dana Greene, of the General Electric Company, was warmly greeted by the representatives of the Edison companies. He is a popular official.

Mr. Hugo Reisinger, the importer of the "Electra" carbons, greeted many friends at the convention, and was accompanied by Mr. John F. Outwater, the popular representative of the same interest.

Mr. E. W. Rice, Jr., Mr. Kruesi, Mr. Howell, Mr. Page, Mr. Lovejoy and Mr. W. S. Andrews were among the parent company officials whom all the visitors were glad to meet and exchange views with.

There were a number of carbon representatives present, including Messrs. Reisinger and Outwater, of the "Electra;" Mr. Dickey, of the American company, and Mr. Crider, of the Washington company.

"I find many interesting things about X-ray experiments," said C. D. Haskins. "I got a bright beam of light the other day, and then it suddenly disappeared. I am hunting for it again, so far without success."

Messrs. Gilmore and Mallory, of Mr. Edison's laboratory staff, accompanied their chief to the convention, and enjoyed the brief respite at the seashore, as hard-working men do. Mr. Mallory is recovering from a severe illness.

It was generally remarked how vigorous and active Edison seemed to be, and one had only to talk with him a moment to find that he possessed all his old-time fire, enthusiasm and quickness of perception. The camera young men were numerous and many snap-shots of the famous inventor were secured. The one that will be most highly prized by its owner was the picture that caught Edison as he was convulsed over the funny tale by Mr. Arkell, of *Judge*, who was relating his experience with a crank inventor. Edison had a few like experiences of his own to relate, and these two well known gentlemen suddenly became the center of a large group on the broad Oriental piazza before the highly entertaining series of anecdotes were concluded.

Photographed by Lightning.

A mysterious vagary of Tuesday night's tornado and electrical storm is reported from Stoughton, Mich., says the Baltimore *American*. A large barn had been recently erected by Abner Millikan, facing the main street, and he, being an ardent Republican, decorated the newly painted sides with large lithograph portraits of McKinley and Hobart, "the workman's friends." During the progress of the storm lightning played about the building repeatedly, and during the second storm, which came at 1.30 A.M., a blinding flash of lightning was seen to envelop the building in a sheet of flame. Millikan and his hired man hastened to the building, expecting to find it afire in a dozen places; but, to their astonishment, the bolt appeared to have done no harm. When daylight came it was seen that the lithographs had been torn bodily from the barn, and in their place was a perfect reproduction of the portraits, to the smallest detail, photographed on the newly painted sides of the building.

Armington & Sims Ask For a Three Years' Extension.

At a meeting of stockholders of the Armington & Sims Engine Company, of Providence, R. I., held on August 14, it was voted to ask for an extension of three years. The company owes $275,000 and has assets of $270,000. There are a considerable number of orders on hand, and it is believed that the extension will be granted. The company were pioneers in the building of high-speed engines, and their product enjoys a high reputation, especially in the electrical field, where a large number of their engines are in use.

In the actual use of electric current for industrial and commercial purposes, Buffalo, N. Y., promises to become the leading city in the world.

THE CONTRACTOR'S FAIR PROFIT.

READ BEFORE THE ILLINOIS SOCIETY OF ENGINEERS AND SURVEYORS BY JOHN H. BURNHAM.

Men are generally said to be in business for profit, although there may be a very few cases where they follow business for their health. While it is perfectly proper to discuss the question of pay or profits due the profession of engineering, it is also equally proper to consider what is a fair profit for contractors, because engineers as a class are being brought constantly into contact with engineers.

There are three classes of engineers. One class consider it their sole business to see that no profit whatever is made by contractors. Another class is sometimes said to be at the opposite extreme, and to be perfectly willing that contractors shall make any amount of profit, asking, however, a percentage of the profit for themselves.

We will assume neither of these classes are represented in this society, but that all of its members are in the large class to be found between these two extremes, and willing to see contractors make a fair profit. They will, therefore, thank me for taking a few moments for the consideration of the question of what is a fair profit for a contractor, more particularly because very loose ideas generally prevail as to this whole subject.

To the general public the prevalent idea is that all contractors are rich, or rather that the contracting business is quite sure to make a man rich. Too many of you, from your own observations, are tempted to believe that no contractor ever gets rich, that they all belong to an endless procession marching recklessly towards financial graves. Fresh victims are constantly joining the ranks of this procession, you may say, and there need be no fear that the line will ever falter, or the public interests suffer for the lack of proper bidding material. Quite possibly this may be the truth, and yet some of you may have a lingering desire to see enough substantial and honorable contractors to form at least an excuse for basing your estimates upon the possibility that some portion of the public money may be so expended as to fall into the hands of men who will not consume the whole amount in work performed at actual cost, or less. It is assumed to be your wish, and that of your employers, or of the public, that all work done under your direction shall be properly performed according to strict and just specifications, prepared by honest and competent engineers. It is fair to assume that all bidders, all contractors, ought to expect to perform their contracts in strict accordance with fair and intelligent specifications. It is also right to assume that these contractors shall not only bid to thus perform their work, but shall also bid so as to give themselves a fair profit on their contracts. They are in the business for the profits and for nothing else. It is their right, their undoubted right, also, to bid for all the profit they can get. They have as much right to all the profit they can obtain as any one else has to all he can earn in his business or profession.

The *Engineering News*, of November 21, 1895, in speaking editorially upon a subject somewhat related to this topic, says: "It ought to be entirely plain to every one that the contractor has just as much right to endeavor to secure a high price as the party who lets the contract has to secure a low one."

It is plain, therefore, from this authority, that the contractor has a right, not only to a fair profit, but to all the profit he can secure, and it is the business of engineers and public officials to see that the contractor does not secure too high a profit. All I am maintaining is that he is fully and properly entitled to some profit in the long run, and it might as well be defined a fair profit, which definition is, in one sense, no definition at all, and yet it may stand as some basis for our discussion, and we can at least disabuse our minds of the idea that it is right and proper to continue the present crude and almost savage system of public competition.

Suppose we analyze the elements of the cost of the work, adding thereto a fair profit:

1. There will be the cost of the materials used in construction. This cost should be made of the very lowest possible prices to be obtained by purchase, in as large lots as possible, from the very best dealer to be found, promptness of delivery and reliability of seller being elements to be duly considered.

2. Economy in labor must be studied by the contractor, and no drones or useless laborers should be allowed on the work. How far this item in economy in labor should be pursued is a question for consideration. A class of contractors may be found in some lines of work who always employ low-priced foreign labor, and in some extreme cases they have been known to run saloons or boarding houses at which their laborers are obliged to spend quite a large portion of their earnings. This sort of competition must often be met by contractors, and the inevitable tendency of modern competition seems to show that our system of letting public work to the lowest bidders will very soon drive many lines of contracting into the hands of this or a lower class of contractors. Sooner or later the law or the people must grapple with questions like this, and we already have a forewarning of what is coming by the passage in this State of a law three years ago which provides that public money shall not be paid to foreign laborers who have not taken out their first naturalization papers. This law is as yet little known, and it is very important that it should be enforced.

(To be concluded.)

In this issue of the ELECTRICAL REVIEW will be found a very interesting installment of Mr. Mark A. Replogle's papers on "Electricity and Water Power." This subject is daily becoming of more importance, and we are gratified to know that our articles on the question have met with a flattering reception by our readers.

ELECTRICITY AND WATER POWER.

BY MARK A. REPLOGLE.

(Continued from page 51)

PART II.

POWER AT THE FALLS OF THE WILLAMETTE, OREGON CITY, OREGON.

The Willamette River drains the most populous valley in Oregon. The valley extends in a northerly direction, and is found in the western part of the State, bounded by the Cascade Mountains on the East, and by the Coast Range on the West. The river is a combination of the streams from these mountains, and winds its way north to the Columbia River in the vicinity of Portland.

The vicinity of Oregon City seems destined to become noteworthy. Sometime during the long ago, when old Mt. Hood was in the vigor of his youth, an attempt was evidently made on his part to possess the lower valley by throwing great fields of lava across it at the above mentioned point. Although the lava beds lay directly across the valley several hundred feet in depth, the river has cut through them gradually until it now falls over a broken precipice, about 40 feet high, to the lower level. The waterfall, as well as other favorable conditions, made this a home for the Indian. Even now there can be found a few remnants of the tribe that possessed these Falls before the appearance of the white man. Some of these aged and tottering redmen tell how this valley was owned by the coyotes previous to the possession by the Indian. They tell how the great coyote chief would marshal his forces on the high bluffs, and then march down to give battle to the salmon and eels during their attempts at scaling the falls to take possession of the valley above.

Mt. Hood, coyote and Indian have each in turn relinquished his right to these beautiful Falls, and they now are the property of the Portland General Electric Company, of Portland, Oregon.

A canal has been built to allow the steamboats to pass up the river to the many small cities above. A portion of this power is used for paper mills, woolen mills and various other kinds of manufacturing establishments. A great quantity has also been carried to Portland, some 4 miles away, for lighting and power purposes.

The Portland General Electric Company have control of both sides of the river at the Falls of the Willamette, and on the east side is found their Station A. This station is constructed on the lines of a manufacturing plant; that is, they use small units of power, and these are harnessed up by the use of line shafts, belts, etc. Station A was a marvelous station when it was first constructed. It has a capacity of 3,000 horse-power, and now contains eight 1,500-light alternating-current generators, one 2,000-light alternating-current generator and nine 100-light arc dynamos.

These dynamos have been furnishing light in Portland for some years past, and the success that attended the efforts of the promoters at this station, as well as their experience in its manipulation, led to a conception of an ideal power station.

This power station is being gradually built as demands are made for power and light by the cities and towns within reach. Already five of its great dynamos are pouring into Portland the energy to propel all of the electric and cable cars in the city. The many suburban lines also get their power from this new power house, known as Station B.

This great power house and its equipment furnish many new and valuable lessons to the student in mechanics. While it looks in general as a simple proposition in mechanics and hydraulics, yet its advancement and final success depended upon the solution of some of the most intricate problems that have yet appeared in developing electrical water-power plants. It being an unqualified success makes it a lasting memorial to the energy of its promoters, and the genius and untiring zeal of the engineer who designed it and forced it to completion.

Some of the problems solved deserve special consideration, and a few of them will be noted. The most important one is the great variation in the head. There are times in the year when there is an available head of 42 feet. This usually occurs in the late Summer and Autumn, after the Columbia River has fallen. During the Summer months, when the Columbia River is high, from the melting snow in the mountains, it backs the Willamette up often to the height of 20 feet, thereby deducting that amount from the height of the Falls. Since it is impractical to make a water-wheel run successfully at a given speed under variable heads, it was necessary to design a plant that could furnish its full power under a 22-foot head, a 42-foot head, or any head that would range between these two extremes.

On account of these changes in the tail water, the use of horizontal wheels was practically out of the question. If they could have been used the problem would have been less grave, as a high head wheel and a low head wheel could have been attached to a horizontal dynamo, one at either end, and by the use of friction clutches these wheels could be connected or cut out at will.

The design adopted and in use for each unit of power is two vertical turbines, whose upright shafts can be connected at will by tightening a great connecting belt. The smaller turbine is on the side of the power house next to the river, and is designed to furnish 600 horse-power from 32 feet to the maximum head. The shaft of this turbine extends up to the dynamo-room floor, where it forms the axis of the armature of a great dynamo, which is the electrical unit of each section.

The large turbine is on the canal side of the power house and is designed to furnish 600 horse-power at the lowest head of water. The two turbines are in the same iron penstock, and discharge into one large draft tube. The smaller wheel can be disconnected, when the head is too low, by taking the pins out of a coupling below the drive pulley. It is now plain that the small wheel can furnish the desired amount of power alone under the higher heads; also the large wheel can furnish it alone under the lower heads; and the two wheels connected can furnish it under the mean heads. The wheels and dynamos are of American design, and are regulated by governors, which are also of American design.

A second difficulty was to support the great weights that were found in the shafts and pulleys. These in the main are supported by a system of collar or ring bearings that run constantly in oil. The weight of the armature is sustained by means of a drum piston head attached to the small turbine shaft. This fits closely into a cylinder that is supplied with oil at a pressure of 175 pounds per square inch. The oil is furnished from a separately driven pump, and the small wheel that drives it is automatically governed by the motion of the accumulator ram. All the thrust bearings are inclosed by water jackets, through which a constant flow is kept up by a separately driven water-pump, and by a gravity system from flumes.

When this station is finished it will constitute 22 sections, each one containing two water-wheels. The first section contains the two small pumping wheels, the second, third and fourth contains each a large and a small turbine, as described above; and the fifth contains two 500 horse-power turbines that drive the duplicate exciter dynamos. Seven more sections are in the course of construction, and the balance will be built as necessity demands.

The foundations and the building are made from the finest quality of concrete, and rest on bed-rock from 25 to 36 feet below low-water mark.

A third problem was transmission. The sub-station is in the center of Portland, 14 miles away. Willamette power must be carried to this distributing point with as little loss as possible. The plan adopted is high-tension three-phase current, and the dynamos are constructed to generate at a pressure of 6,000 volts, which is transformed to lower voltages in the Portland station.

These machines are most extraordinary in their construction and performance. As stated before, they are of the vertical type, and were designed for this plant. The field magnets are supported by a great iron cylinder, about nine feet in diameter and five feet high. It is shaped so as to give a massive, yet symmetrical appearance. This great base is surmounted with a walk that surrounds the collector rings, and the walk is inclosed by a substantial and neatly designed railing, the whole presenting an artistic appearance, combining the desirable points, compactness, simplicity, capacity and durability.

Each of these dynamos was designed to generate 600 horse-power at 200 revolutions. Practice has shown that they have generated 900 horse-power for days at a time, and it is thought that they could furnish 1,200 horse-power for a few hours with safety. They each have a weight of about 57,000 pounds.

The two exciter dynamos are of a similar design, but they are only about three and one-half feet high. They furnish a direct current of 550 volts, and each has capacity to excite all of the large dynamos when the station is completed. The necessary switchboards are placed in convenient places, and from these the wires lead direct to the sub-station in Portland.

The sub-station is a neat, business-like institution. The lower story contains all of the transformers, switchboards and workshop. One apartment contains all of the stationary transformers; a second room contains all of the measuring instruments, switchboards and rotary transformers, and a third room is used for a repair shop.

At present there are but two rotary transformers used. Each of these takes the current from one of the large dynamos, after it has been stepped down, and makes of it a direct current of 550 volts pressure for the street-car and motor lines. The current for lighting purposes leaves the transformers direct to the city mains.

The second story of the sub-station contains the offices of the company. They are commodious, neat and finely furnished.

Here is a truly representative power plant. It is cosmopolitan in all its bearings. When finished it will have in use more water-wheels than any other known electric-power plant. It will operate more large dynamos than any known plant. It will have a capacity of 12,000 horse-power at the power station, in Oregon City, and the loss in transmission to Portland is within 15%.

ELECTRIC POWER IN CANADA'S CAPITAL, OTTAWA, ONT.

In reviewing the water-power-electrical development, it will be noticed that none were quicker to see its advantages, or were earlier in the field, than our nearest American neighbors. It can be safely said that the first large, substantial electric-water-power building in America was built at Ottawa, Ont., by the Standard Electric Company. It is a massive stone building, equipped with all the best machinery known up to the date of its completion in 1891. This is referred to as Station No. 1 in the description of stations that follows:

Canada has many noteworthy developments, but no city contains so many of them as her capital on the Ottawa River. This river is a tributary to the St. Lawrence and drains a heavily timbered valley in southern Canada. It also furnishes an outlet for a number of lakes in the provinces of Quebec and Ontario. The river contains an

abundance of water at all times during the year, and enters Ottawa with a grand leap known as the Chaudiere Falls. The well timbered country up river and the above-named Falls make Ottawa one of the greatest lumbering and water-power cities in America, and this is beyond doubt why her citizens were among the first to use electricity generated from their natural power supply.

All of the lighting and power, except that used by the street railways, is furnished by the Ottawa Electric Company. This company is an amalgamation of three electric lighting companies, and has four separate water-power stations, also a station operated by steam as an auxiliary, used only during the Winter months, when the river is filled with anchor ice to such an extent as to interfere with any of the water stations.

Station No. 1 (mentioned above) contains a number of large alternating lighting generators, also several large power generators, all of Canadian design and make. These are driven by means of counter-shafts and belts from five 66-inch water-wheels, running under 16½ feet head. The wheels are all of Canadian manufacture, and use governors from the United States. The capacity of the five wheels is 1,825 horse-power, and they are all of the vertical type, in which bevel core gears are used to transmit the power to horizontal shafts.

Station No. 2 is the arc lighting station, and contains three vertical turbines 60 inches in diameter, and one 48 inches in diameter. The power is transmitted to counter-shafts in this station by the means of rope drives, and the estimated capacity approximates 1,468 horse-power.

Station No. 3 is the steam auxiliary, and has a capacity of 1,200 horse-power.

Station No. 4 contains two 60-inch and one 48-inch vertical water-wheels, running under 16½ feet head. This station is devoted to alternating lighting, and uses governors from the United States. The wheels of this station, as well as Station No. 2, are of Canadian make and design. The capacity of Station No. 4 is 920 horse-power.

Station No. 5 contains four 48-inch and two 60-inch vertical water-wheels, running under about 14 feet head. This station furnishes direct current for incandescent lighting, and uses governors from the United States. The capacity of this station is 1,188 horse-power.

This shows an aggregate of 5,401 horse power, exclusive of the steam plant, furnished by one company for the lighting and the small power of the city.

Added to the above is the power from the Ottawa Electric Railway Company's power plant. This plant is run by water also, and has a capacity of 1,500 horse-power, making a total of 6,901 horse-power used in only one of Canada's many cities.

The above-mentioned railway company are among the first that attempted to use water power to drive electric generators for street railway purposes. They have increased their power and improved their machinery until the plant has a capacity of 1,500 horse-power in three units; one 700 horse-power generator, and two 400 horse-power generators. These machines were designed and built in the United States.

The water-wheel gates are operated in this station by hand through a frictional gearing, and the extreme fluctuations in voltage are overcome by separately exciting the field magnets of the generators.

This plan seems to have been original in this plant, as it also was in several plants in the United States, and the success that has attended its use in all cases should commend it to the serious consideration of the owners of water-power plants in America.

The idea is to excite the fields from a constant-speed dynamo, thereby keeping a given pressure; hence, even current for exciting purposes. The voltage on the power generator can then only vary in the same ratio as the speed, where, if self excited, it would vary in about double the ratio of the speed.

Ottawa has 30 miles of electric railways. It has some fine parks and athletic grounds that furnish patronage for the street railways. It is a city of 50,000 people, and boasts of having an incandescent light for each of its population. The city is three and one-third hours by rail from Montreal, the metropolis, and is only a few hours from the United States line.

Ottawa is recognized as being of first importance, electrically, in the Dominion, and enjoys the distinction of having first solved the snow problem, demonstrating that an uninterrupted electric street railway service could be successfully maintained throughout a Canadian Winter.

There are many more interesting water-power plants in Canada, but the writer has not the time or space to devote to them. The data for this paper was furnished by the general superintendent of the Ottawa Electric Company, to whom obligation is acknowledged for the courtesy so promptly shown.

(To be continued.)

Crookes Tubes.

To the Editor of Electrical Review:

Who deals in Crookes tubes? Also, send me addresses of some reliable companies who make fluorescent screens.

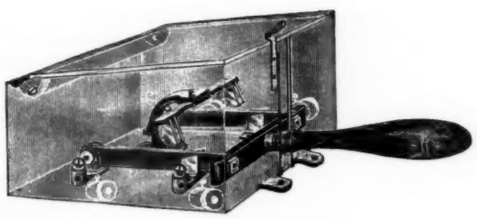
W. B. Anderson,
Care Electrical Review,
New York.

August 8.

Electrical Illumination of Warships.

At the Halifax carnival just closed, one of the principal attractions was the electrical illuminations of the warships and the illuminated procession in the harbor of steamers, yachts and boats. The flagship "Crescent" was decorated from the water-line to the trucks with incandescent lamps, showing plainly the shape of the hull as well as the masts, yards and funnels, even more minutely than was done on H. M. S. "Blake" when she was in New York. The other English and French warships, and the cable ship "Mackay-Bennett," made wonderful displays with their search-lights and blue fire.

The illuminated procession had a very pleasing effect, the steamers and yachts being decorated with all sorts of lights. The handsomest of all was the steamer "Annie," on which had been placed a special engine and dynamo, with strings of incandescent lamps, covered with fancy shades and reflectors. This installation was the work of John Starr, Son & Company, Limited, the electrical firm of Halifax, who had a party of friends on board, among whom was Mr. S. A. Chase, of the Western Electric Company, of New York.



A Springless Arc-Knife Switch.

Page Belting Company To Be Reorganized.

It is reported that the Page Belting Company, of Concord, N. H., is soon to be reorganized. The company is capitalized at $500,000. The building and plant is worth about $75,000, although the cost was $170,000. Their Boston, New York and Chicago salesrooms have carried enormous stocks, and their interest account and depreciation in leather is said to have caused considerable shrinkage. It is stated that the stock will have to be scaled between 50 per cent and 75 per cent.

A Springless Arc-Knife Switch.

The Utica Electrical Manufacturing & Supply Company, of Utica, N. Y., are the manufacturers of the arc-knife switch illustrated herewith. They claim several strong points of merit for it, among which are that there are no springs to break and the switch is always reliable. This company, besides carrying on a general repairing business, manufactures incandescent and power knife switches, lightning arresters and single and double-pole iron-box fuse boxes.

Canadian General Electric Company Burned Out.

About one-half of the Canadian General Electric Company's large plant at Peterborough, Ont., was recently destroyed by fire. The loss is estimated at $100,000.

Erie Telephone Company's Business Statement.

The officers of the Erie Telephone and Telegraph Company, one of the highly successful Bell licensees, owning large territory in the West, northwest and southwest, are Levi Sprague and Chas. J. Glidden, of Lowell, Mass., president and treasurer, respectively, and J. P. McKinstry, of Cleveland, Ohio, general manager. This company paid a quarterly dividend of one per cent August 17. The following comparative statement, showing net gains in subscribers of 672, will interest all our telephone readers:

Quarter ending June 30.	1895.	1896.	Increase.
Gross income	$258,477.92	$289,559.36	$31,081.44
Gross expenses	147,249.91	169,986.13	22,736.22
Net earnings	$111,228.01	$119,573.23	$8,345.22
Dividends	100,500.00	115,500.00	15,000.00
Surplus	$10,728.01	$4,073.23 Dec.	$6,654.88
Proportion of dividends received by the Erie Telegraph and Telephone Company	$69,600.00	$78,725.00	$10,125.00
Fixed charges and expenses	14,200.17	24,415.98	10,215.81
Net income	$54,399.83	$54,309.02 Dec.	$90.81
Dividend	48,000.00	48,000.00	
Surplus	$6,399.83	$6,309.02 Dec.	$90.81
Proportionate part of the surplus of the subcompanies due the Erie Telegraph and Telephone Company	7,351.85	2,745.97 Dec.	4,605.88
Total surplus	$13,751.68	$9,054.99 Dec.	$4,696.69

SUBSCRIBERS.

	March 31, 1896.	June 30, 1896.
Exchange	18,060	18,666
Agency	1,224	1,290
Total	19,284	19,956

Passaic Lighting Company's Improvements.

The Passaic, N. J., Lighting Company will occupy its new station at Columbia avenue and Passaic street about September 1. This station is a one-story brick building with a separate brick building for the boiler house which contains three 200-horse-power Stirling boilers. The company supplies current for all the electric lighting in Passaic and for the Passaic & Newark Electric Traction Company. The company operates at present four Thomson-Houston 50-light arc machines, one multipolar General Electric generator of 325 amperes, three Thomson-Houston incandescent dynamos of 700, 1,300 and 2,000 lights capacity, respectively, one Thomson-Houston generator of 150 amperes. The steam plant consists of two tandem Corliss engines of 400 and 500 horse-power, respectively. When the plant is moved the company expects to accomplish the task in one day. In addition to the machinery mentioned, there will be installed in the new station another 150-ampere Thomson-Houston generator and a new Watts-Campbell engine. Mr. C. A. Stelling is superintendent of the Passaic Lighting Company.

The Hon. Robert P. Porter, in the August number of the *North American Review*, gravely asks, "Is Japanese Competition a Myth?" Mr. Porter's recent extended tour of Japan afforded him the opportunity of observing on the spot the growth of Japanese industries, and he arrived at the opinion that Japan will soon be a formidable competitor of Europe and America in the markets of the world.

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SPECIAL NOTICE TO ADVERTISERS.

***CHANGES** for advertisements must be in this office by Friday noon for the following week's issue.*

***NEW ADVERTISEMENTS** should be in the office not later than Saturday noon to insure publication the following week.*

NEW YORK, AUG. 19, 1896.

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The suggestion that the several electrical associations of the United States should arrange for conference committees is a good one.

President Frederic Nicholls, of the National Electric Light Association, evidently believes in working between conventions. His intelligent activity at the present time can not fail to be of immense benefit to the next convention of the association and to the interests it represents.

We can not understand just what this silence means, but we have not heard of a new street-car fender for three weeks.

The American Association for the Advancement of Science will hold its forty-fifth meeting in Buffalo, August 24 to 29.

A new publication offers two telephones as a premium for 15 new subscribers. The canvasser that starts in on this basis will not open a telephone exchange right off.

If the recent conference of incandescent lamp manufacturers results in maintaining prices at a fair manufacturer's profit, the advantage will as quickly come to the consumer as to the manufacturer. A better product is sure to be the outcome.

A young electrical monthly boasts of having delivered nearly 4,000 copies of its last issue to a news company for distribution throughout the United States. If "for distribution" the words "on orders" could have been truthfully substituted, how nice it would have been.

The affairs of the Mutual Automatic Telephone Company, of Philadelphia, are being ventilated. If it is true, as alleged, that Dave Martin and his political associates sold their influence for $362,000 of stock in the company, our guess is that they put a very low valuation on their services.

The various electrical houses are weathering the hard times with noticeable success. After three years of continual contraction in business and profit on manufactured goods, and while passing through an unusually disconcerting political Summer, the electrical industry is without any large failures, and the enterprising men engaged in the business speak hopefully and encouragingly of the future. We hope and expect to see all their hopes beginning to be realized before another six months.

Our esteemed contemporary, *The Railway Age*, of Chicago, has issued a call to the railway men of the United States requesting them to organize for the preservation of sound money, "in support of the country's prosperity and the country's honor." This is a good move. As to the electrical field, we have yet to learn of any member of it who desires to debase our currency, or permit it to be one whit less valuable than the standard of all the other enlightened countries of the world.

The seaside convention of the Edison illuminating companies last week was another successful gathering—the seventeenth since the organization of the association. Although the line separating the members of this association from the National Electric Light Association has about disappeared, through the consolidation of the parent companies, yet there is still an apparent field of usefulness for the Edison organization, and the convention at Manhattan Beach was just as full of interest to the participants as any one previously held.

"Good material carefully installed" is more than ever the demand in electrical construction circles. Particularly is this true with the various insulating products. In former times this product was scarcely considered for outside work, but now it constitutes such a large item in electric railway construction that the material is subjected to severe tests before being adopted by the companies. Every new discovery in this field is promptly tried, and some of the later products are reported as possessing distinct values.

Grass in the streets is now a sign of progress in any community equipped with a trolley road. The passing of the car horse, with his iron-shod feet, leaves nothing to trample down the grass and weeds that spring up between the car tracks. It is said that some electric railways have gone so far as to cultivate strips of lawn between the tracks. It is a pleasing notion.

According to the New York *Tribune*, the Nassau Railroad Company, of Brooklyn, N. Y., have in their employ a large number of insolent and incompetent conductors on their lines running to Bath Beach, Bensonhurst and Coney Island. This is an evil that should be remedied at once. Has prosperity made the officers of this road megacephalic?

If we may be permitted to predict: Look out for a decided improvement in electrical business during the next 60 days. A number of construction deals, whose timid backers are just realizing that this country is all right, are now getting under way, and there are many more to follow.

There are thousands of people able to afford luxuries who need just such an example as the recent heated term to convince them that there is comfort in an electric fan. These devices are rapidly coming to be actual necessities.

The Street Railway Association of the State of New York.

The fourteenth annual convention of this association will be held at the Hotel Bennett, Binghamton, N. Y., on Tuesday, September 10, at 10.30 A.M. The following is the programme of the meeting:

9.30 A.M., meeting of Executive Committee.

10.30 A.M., meeting of the association.

ORDER OF BUSINESS.

1. Call of the roll.
2. Approval of the minutes.
3. Address of the president.
4. Report of the Executive Committee.
5. Minutes of special meeting of the Executive Committee.
6. Report of the treasurer.
7. Reading of reports on practical street railroad questions by well known gentlemen; names and subjects to be announced.
8. Discussion ensuing.
9. General business.
   - I. Appointment of Nominating Committee.
     - *a.* Nomination of officers.
     - *b.* Selection of place of next meeting.
   - II. Election of officers.
10. Adjournment.
11. General entertainment, including trolley ride to Ross Park, State Hospital and other local points of interest, terminating with a 10-mile ride to Union. Luncheon served at the Casino by the Binghamton, Lestershire & Union Railroad Company.
12. 8.30, banquet at Hotel Bennett.

Electric Plant for the City of Mexico.

Hon. Eugene Germain, United States Consul at Zurich, writes to the State Department as follows:

In the official commercial organ of Switzerland (*Feuille Officialle Suisse de Commerce*) I notice that the Consul of Mexico, stationed in this city, sent a communication to the editor of the paper wherein he states that the authorities of the city of Mexico are about to introduce electric lighting, and invites bids from Swiss firms engaged in the manufacture of electric appliances and willing to enter into a contract to put in the plant.

He states that upon application to him, either by correspondence or by a call at his office, he will submit plans and specifications, and also furnish detailed information as to just what is required. This reminds me that on my last east-bound trip, while crossing the ocean to return to my post, I met a Haitian from Port au Prince. He stated that he had a concession from the authorities of his native city to supply it with electric light. He was on his way to Europe to see where he could buy the best plant and appurtenances for the least money. A prominent Frenchman engaged in the coffee business near Port au Prince confirmed what the commissionaire told me.

It strikes me that our neighbors are going out of their way to secure in Europe what they could find as good, if not better, and at as low a figure, near home.

I have always had the idea that we can beat the world on electric machinery and appliances, and I dislike to see business slipping away from us right by our doors. I would very much like that the attention of American firms engaged in that line of trade be called to the above information, and that I may have the gratification to see Americans put in an electric plant in the city of Mexico.

Grass in the Streets Is Now a Sign of Progress.

It used to be regarded as extremely discreditable to a city to have it truthfully said that grass grew in the middle of its streets, and the person who made the remark was regarded as an enemy from a rival town, says the New York Evening *Sun*. The remark has lost its sting now, and people point with pride at the blades of grass struggling in the chinks between the paving blocks. It is an evidence of progress, and proof that the people of the place are hustlers. Conditions have changed in the last six or seven years in nearly every city in the country. Grass could not have grown in the middle of the busiest thoroughfares then, while now the busier the thoroughfare the more chance it has to grow.

The electric railroad lines have brought this about. Where they run most frequently they have the tracks and the spaces between the rails and between the tracks almost entirely to themselves. Drivers of vehicles do not care to be constantly turning out for trolley cars, and consequently they keep out of the middle of the streets and off the car tracks. In the horse-car days the grass was kept down by the iron-shod hoofs, not only of the car horses, but of those attached to all kinds of vehicles whose drivers found it convenient for themselves and easy for their animals to make use of the smooth rails.

Then the grass did not grow in or between the tracks to any extent. Since the advent of the trolley there has been a strong tendency in some towns to encourage the growth of grass upon the part of the road occupied by the tracks, and trolley lines have been laid out upon many new roads in the outskirts of various cities with the view of having an eye-resting and pleasing strip of greensward the whole length of the line. The roads have electric sprinklers and sweepers, and perhaps the next interesting feature of trolley progress will be a track mower run by a motor to keep the grass down to the condition admired in private lawns and public parks. Then, as a natural consequence, there may be a trolley rake to follow.

Get Ready For The Clam-Bake!

The invitations are out for Mr. Eugene F. Phillips's eighteenth annual Rhode Island clam dinner. The festivities will occur at the Pomham Club, Providence, R. I., on August 22, which is Saturday—and the next day is Sunday. Lunch will be served at 11.30 A. M., and the bake will be unfurled at 2 P. M. Although Mr. Phillips and the whole American Electrical Works outfit are sound money men, it is understood that this clam-bake will be tinged with a Bryanesque flavor; that is, there will be something of the 16 to 1 business about it—16 clams to every man. The report, which has evidently emanated from some one who is not expected to the bake, that there would be but one clam to every 16 men, is a canard.

TELEPHONE NEWS AND COMMENT.

Ada, Ohio, has purchased its telephone plant from the American Electric Telephone Company, of Kokomo, Ind.

The American District Telegraph Company has declared a dividend of one per cent, payable August 17 to stock of record August 10. Books reopen August 17.

Erie Telegraph and Telephone Company made a net gain of 207 subscribers in June. Total gain for first five months, 1,163. Total number connected July 1, 19,961.

A franchise has been granted to a competitive telephone company at Muskegon, Mich., and it is claimed that an exchange of at least 400 subscribers will be installed.

The telephone question is being agitated at Cortland, N. Y., and application has been made for a franchise from the village board of trustees to construct an exchange.

Cedar Rapids, Iowa, is installing a 500-subscriber plant, full metallic circuit, using Kokomo-Hunnings apparatus throughout. This will be one of the finest plants in the State.

The manner in which the Mutual Automatic Telephone Company secured its franchise in Philadelphia is under investigation by a Senate committee. It is alleged that several prominent politicians exchanged their influence for stock in the company.

At the annual meeting of the Yarmouth Telephone Company, held at Yarmouth, Maine, on Saturday, August 1, officers were elected as follows: John Coombs, president; Geo. E. Coombs, secretary, and A. H. Coombs, treasurer and general manager.

The stockholders of the Metropolitan Telephone and Telegraph Company held a meeting last week and voted to dissolve that corporation. The business of the company has been turned over to the New York Telephone Company. All contracts and accounts for settlement are assumed by the last-named corporation.

A competitive telephone exchange of 60 offices has just been opened to the public at Cobleskill, N. Y. Connections have been made by toll lines with the principal towns in the county. The lines are constructed in the best possible manner and high-class apparatus has been installed. The work has been done under the direction of Jesse E. Whiting, of Montrose, Pa.

In the midst of the discussion, at Syracuse, N. Y., over subway franchises and the ordering of all wires underground in the centre of the city, the Western Union Telegraph Company is taking steps to utilize the subway which has laid under the Washington street pavement for three years. The company has received three carloads of underground cables, which it will require about two weeks to install.

A Chicago press dispatch says that the Cosmopolitan Electric Company, which secured a franchise from the City Council during John P. Hopkins's term as Mayor, is now figuring with a new telephone company for the use of conduits. It is authorized to build for telephone wires. The new company is said to be an offshoot of the Harrison International Telephone Company. The company is preparing for active work. It recently laid conduits under the west side boulevards. It is proposed to carry on the work, to lay more conduits and electric wires, and to enter actively into the furnishing of electricity for light, heat and power. This is the statement made by people interested, who are for the most part identical with the people interested in the Ogden Gas Company.

PERSONAL.

Mr. Charles J. Glidden, vice-president and treasurer of the Erie Telephone and Telegraph Company, returned from Europe last Saturday.

Mr. W. F. Zimmerman, of the Westinghouse Electric and Manufacturing Company, returned to New York last Wednesday, after a three months' vacation in Europe.

The ELECTRICAL REVIEW congratulates President Russell B. Harrison, of the Terre Haute, Ind., Electric Railway Company, on the birth of a son on August 10. He is to be given the patriotic American name of William Henry Harrison.

Mr. George R. Mair, for several years connected with the mining department of the General Electric Company, has gone to South Africa to accept a responsible position with the United Gold Fields, Limited. Mr. Mair will supervise a large electric mining installation for this syndicate.

The Electrical Stock Market.

Wall street was dull last week as compared with the final prices of the previous Saturday; the list was higher with a few exceptions. Bryan's Madison Square Garden speech had little or no apparent effect on the market.

To-day 350 shares of General Electric changed hands. The opening price was 24, the lowest 23¾, the closing 23½ bid and 23¾ asked.

The closing prices on the Boston Stock Exchange were as follows:

	Bid.	*Asked.*
Edison Electric Illuminating	135	140
General Electric	23½	..
General Electric preferred	56	58
Lamson Consolidated Store Service	16	..
Westinghouse Electric preferred	48	49
Fort Wayne Electric	1	2
Fort Wayne Electric Trust (series A)	3½	4
Thomson-Houston (series C)	3	..
Thomson-Houston (series D)	3½	4¼

New York, August 15.

The rapid transit question in New York city continues to drag out its weary length. A little less politics and a little more engineering ability would doubtless assist the matter to a quicker conclusion.

ELECTRIC FIRE PUMPS FOR MILLS.

BY CHARLES L. NEWCOMB, M. E., IN "CASSIER'S MAGAZINE"

The independent protection of mill property from the ravages of fire has always held a prominent place in the consideration of fire risks. This interest is due first, probably, to the great value represented in the extensive structures and the expensive machinery contained in them; second, to the danger of fire being generated by the machinery or by various necessary supplies; third, because, often from considerations of shipping facilities or power, the location is distant from a public fire department; fourth, there is usually such an abundant supply of power that great reliance may be placed upon it to assist, if not to supplant, all other protection.

Partly from the individual interest of owners, and more prominently from their combined interest, as represented by mutual mill insurance companies, rapid strides have been made in adopting new fire fighting appliances and a stimulus has been given to the perfecting of such devices. But this is not the age in which to say that for this reason a resting place has been reached. A system may be pronounced excellent and the best thing possible, simply because it is the best that has yet been found. But it is liable at any time to be made second best and, therefore, open to criticism by the advent of some new discovery.

A good power pump, connected with the mill shafting, affords a certain amount of protection. The possibility that this shafting may be disabled by fire, creates a demand for a steam pump in its place or as an auxiliary. A steam pump in a separate building was suggested in order to lessen the probability that the machine itself might fall an early victim to the fire. To hold a supply of water in reserve, if the pumps should fail to start or should stop working, the elevated tank was provided. Certainly, independent pumps, isolated pump buildings and storage tanks were advances, but the pump still depended for its power upon a steam plant located in the mill. In fact, fires frequently originate in the boiler room, and the boilers are almost immediately disabled.

The risk due to delays in discovering the fire and in the starting of the pumps, was lessened by the application of the automatic sprinkler system. To the isolated steam pump has also been added, in due time, an independent quick-steaming boiler. But in the various plans thus briefly outlined, there are obvious weaknesses. The automatic supply is of limited duration, and all other forces, thus far examined, require personal attention and more or less time in their application.

What might be termed an ideal plant would be a pump of ample capacity, located at a safe distance from the mill, capable of starting automatically, and driven by a power entirely independent of the mill. Much of this has remained as an ideal only, until the rapid extension of electric lighting and electric power brought an ideal power practically within the reach of all. The steps necessary to apply this recent acquisition to the fire protection system of a mill are few and simple, and it seems most fitting that the mysterious current which has been charged with setting many fires, should now be compelled to assist in their subjugation.

The elements entering into the combination which will transform the energy of the electric current, taken from some convenient line, into an abundant, persistent current of water through the piping of a mill. are these: An electric motor, connected through a suitable switch with the electric line; a power pump, connected with the motor; a sprinkler system, connected with the pump, and a pressure regulator in connection with the pipe system, and controlling the movements of the electric switch. All these parts, except the piping, may be placed in a suitable building at a safe distance from the mill.

Under normal conditions all outlets in the pipe system are closed; the pipes are filled with water under a given pressure, determined by the setting of the regulator; this regulator holds the electric switch open, and the motor and the pump are at rest. Upon the starting of a fire, one or more sprinkler heads open under the influence of the heat, the water pressure falls slightly, the regulator responds to this change, closes the switch, starts the motor and pump, and the necessary water supply is maintained. Any excess of supply over demand will at once raise the pressure, act upon the regulator and stop the pump. Slight fluctuations in pressure may be compensated for by connecting an ordinary pressure tank with the pipe system.

In addition to the pipe connections upon the pump there may be suitable hose fittings from which direct fire streams may be taken when required. Small demands upon the pump will be met by its starting and stopping at intervals, while the use of more openings may require its continuous action. It is evident that the ordinary, as well as the fire, supply may be drawn from this source.

The various parts in this electric pumping plant are all of simple construction. No untried principle is involved. There is no expensive delay in the early movements of the fire, and nothing is left for adjustment during the excitement.

That there are more separate elements in the automatic electric plant than in the appliances which have preceded it, does not necessarily imply that there is greater complication. If the complication were greater, it might well be justified on the ground that it accomplished much greater results. But the increase in elements seems to be somewhat on the principle that a faucet has more parts than a bung. It is also a better device, as it contains, in itself, both the bung and the bung-hole and convenient means of connecting the two. The electric fire pump is not only bung and bung-hole, but an inexhaustible barrel as well.

The electric supply can now be so easily obtained, it can be so readily applied for power purposes, and the new features can be so cheaply added to existing systems, that unquestionably the advances which electricity has brought in modes of communication, travel and lighting, must be soon followed by corresponding improvements in methods of fire protection.

An Electrical Residence.

[*From the New York Sun.*]

The nearest approach to the fairyland of the fable exists in New York city. It is the home of the president of one of the large exchanges, and it is situated on West Seventy-fifth street. In this house it is almost impossible to do a stroke of work or perform a series of concerted actions. Everything is done for you, apparently by magic, though really by electricity. It is probably the most elaborate electrically equipped residence in the country, if not in the world. Everything is done by the current, and it is necessary only to reach out your finger to have it done. It would seem as if the family of the owner must die of lassitude and the servants grow so lazy as never to be fit for work. Most of the servants are figureheads anyhow; they have so little to do.

The occupants of the house seldom or never walk up stairs. An electric elevator carries them from floor to floor and even up to the private roof garden, fitted out with electrical devices. No attendant is required to work this elevator. It is the perfection of automatic action. A single push button on each landing controls it. No matter if the car is above or below your floor, a pressure of the button will call it to you. This is, of course, possible because of the automatic action of the pole-changers and switches which are placed at every floor and are worked by the car itself. Once a certain push button has been pressed, the car passes under the control of the person who pressed the button, and no matter how much the other buttons are pressed they will not act until the first one is released. This is done by means of a commutator which throws all of the other buttons out of circuit; for if two persons on different floors should attempt to work the car one and the same time it might prove fatal to human life. The car door also is automatic, and the car can not be moved until the door is shut and locked. This elevator is lighted by tiny but brilliant electric lamps, and there is a flexible tube telephone in the car which enables one to speak to any part of the house.

Such a thing as the ordinary opening and shutting of a door never occurs in this house. Near every door there is a push button. Press this and the door slides into the wall or vice versa. The pressure of another button locks or unlocks the door. Sometimes it is not necessary to be near the door in order to open or close it. Hanging down beside the beds are what is known in electrical circles as "flexible"—bifurcated cords with wooden knobs or handles on the ends. In each handle are four buttons, marked successively Asleep, Awake, Shut, and Locked. The pressure of the first two buttons sends a signal to various parts of the house that the master or mistress is asleep or awake. The bedroom is approached by a long hall or entry way. Lying in bed the occupant of the house can shut and lock or unlock and open the door at the end of the 50-foot passage by merely pressing the proper buttons. Hanging near the bed is another flexible button which means all kinds of qualified summons to the house servants.

There is no such thing as groping in the dark in this house. Every room can be lighted before entering by pressing a button in the hall approaching it. Furthermore, you can light at will one or a dozen or every light in the room, and there is also one switch which enables every lamp in the house to be lighted at once. Dark closets are unknown in the house. The very act of opening a closet door automatically turns on the current and the interior is lighted up. All of the table lamps are electric and in several cases they are marble statues holding incandescent lamps, small patterns, as it were, of Edison's famous statue of the Triumph of Electric Light. One of them, which stands in the front hallway, was on exhibition at the World's Fair.

The roof of the house, with its electrically lighted garden, presents a beautiful sight from a distance, just as the distance is beautiful when viewed from the roof, for the Palisades lie off to one side with the Hudson in between. Here the family passes its evenings when home in the Summer time. In the kitchen all the cooking is done by the current, and so much of it is done according to new methods that the cook would be practically useless in an old-fashioned kitchen. When a chicken has been prepared and placed in an electric oven, it is only necessary to press a button and watch the clock. As the heat is obtained from over-charged wires, it is distributed evenly all around the bird. Basting is, therefore, not necessary, and the expertness of cooking becomes a mere question of time allowance. A leg of lamb, for instance, will require just one hour and ten minutes to cook. Left in the oven three minutes longer than this and it would be over-done. It is not necessary to look in meantime.

The dining-room of this house is exquisite in tone, the light shedding a gentle radiance down from the ceiling. It is said that the owner even contemplated an electric table which would sink out of sight and its place be taken by another after each course had been eaten, much after the Roman fashion of table removal. The nearest approach in this case, however, is an electric dumbwaiter, large enough to carry a whole dinner course.

It is but one remove from the other idea. The dining table abounds in call bells. The master of the house can give a private signal through the floor by means of a foot push button.

The current used in this plant is all generated on the premises. The house is not situated along the line of a street current. The owner had therefore to install his own plant. Storage batteries supply the current to the house. The cells themselves are stored by a dynamo, which is worked in its turn by a gas engine. This entails no trouble, however, because the switches on the elaborate switchboard are worked automatically by a side current from the cells. A colored manservant keeps his eye on the machinery, and an experienced electrical man pays the house a visit at intervals of one or two months. This in a measure proves the feasibility of electric lighting for country residences.

In fact, everything seems to done at a touch of a button in this house, and the inhabitants have become thoroughly used to it. The owner has tried to enjoy some of the delights of ordinary activity by becoming a photograph fiend, but here the modern destiny of the mansion has pursued him, and his private studio is "electric." Arc concentrating lamps enable the owner to take pictures day and night, and there are electric developing processes on which he experiments. He has even had wires run underground from his cellar plant to the houses of his business partners and for his father-in-law on the next street. He supplies them with lighting current. It is not apparent that there are any electric hair curlers or electric cigar lighters in the house, but there is no reason why they should not have been concealed in some out-of-the-way corner. In short, if there is a genius of domestic electricity abroad it would probably select this house for its residence.

OBITUARY.

Edward May, president of the Mount Morris Electric Light Company, died suddenly in his office at Park Dam and Greenwich streets, New York city, on August 10. Mr. May was overcome by a sudden illness and an ambulance was summoned. When the surgeon arrived, however, Mr. May was dead. He had been in ill health for some time.

Waldo H. Collins, an old-time telegrapher, of late years in the employ of the Gold and Stock Telegraph Company, died on July 11 at his residence in Brooklyn, N. Y., after an illness of three weeks. Mr. Collins was well known throughout the United States as an expert telegrapher. He was 60 years of age, and for many years resided in Calais, Me.

A syndicate of New York bankers, headed by George S. Lee, is said to have secured a majority of the bonds of the Pennsylvania Traction Company, and will reorganize under the name of the Keystone Traction Company.

Electrical Development in Japan.

The Japanese have not been slow in adopting the various applications of electricity, and they have made considerable progress not only in electric lighting, but also in the use of elec tricity as a motive power, says London *Engineering*. For a considerable time past the vernacular press has stated that a system of electric tramways was being projected for Tokyo, and it now appears as if it were about to become a reality, as it is being supported by well known and rich men. The horse tramway company's charter, however, having still some years to run, the electric tramway company will, to begin with, confine its enterprise to districts where other trams do not exist. Some of the newspapers are expressing regret that some arrangement can not be made with the horse tramway company, so as to bring the whole of Tokyo within the range of the electric system, for the use of ponies to draw heavy tramcars. and the execrable state of the streets through which the lines run, are veritable eyesores in Tokyo.

In view of the developments which are taking place in the applications of electricity, the Minister of State for Communications has issued regulations for the control of the arrangements connected with them. They are of considerable length, comprising 111 in all, but their chief points are as follows: The matters controlled by these regulations include electric light, electric railways, and other electric appliances. but electric railways constructed in accordance with the private railway regulations are excepted. Whenever an application to start electrical works, whether for business or private use, is sanctioned by the Minister of Communications, the work must be started within six months, computed from the date of such sanction, and when work is not begun within that period, or is not completed within the prescribed limit, or is not applied to the practical uses for which it was intended, within six months from the date of the issue of the sanction, it may be annulled. Electric currents must be completely insulated from the ground, and lightning rods must be erected at suitable places. The temperature of electric wires through which currents are transmitted must not rise above 20 degrees centigrade, and must not affect any of their surroundings. Wires suspended in the air must be covered, and posts supporting them must be on the roadside. At places where wires cross the road they must be suspended over 20 feet above the ground, and over 16 feet in all other cases. When electric light wires are to be conducted side by side with electric motor wires, the space between the two must be over six feet. Electricity supplied to a dwelling house must be of low pressure, and high-pressure electric wires suspended in the air must not, in case of a single wire, transmit above 50,000 volts, or above 20,000 volts in other cases. Detailed regulations are given with regard to electric railways. They provide that, according to circumstances, the Minister of Communications may forbid the use of ground-laid return-current wires. Wires used for electric railways when suspended in the air must, except in cases specially sanctioned, be over 25/100 sun (fully one-quarter inch) in diameter, and extremely durable ; and the return-current wires, except those laid in the middle of the track or rails, must be insulated from the ground. But when, in places where non-insulated wires are employed, metallic substances are buried underground, the return-current wires, excepting in cases where the consent of the owners of these metallic substances has been secured, must be separated from the others by not less than six feet. Electric railway wires, with the exception of electric car wires, must be conducted along one side of the roadway, whenever any electric light wires or electric motor wires are conducted along the same side. The new regulations came into force from June 1 last, and the reconstruction of those parts of existing electric plants that do not correspond with the conditions laid down in the regulations, must be undertaken within a prescribed limit of time to be specially fixed by the Minister of Communications. Penalties are fixed for contraventions of the regulations, but they are not very severe and are not likely to be much required, as the regulations on the whole are of a reasonable nature.

LITERARY.

Commissioner W. B. Weston has sent to the ELECTRICAL REVIEW a copy of the annual report for the year ending April 30, 1896, of the Board of Police and Fire Commissioners of the city of Grand Rapids, Mich. The report shows that these two departments have in service an efficient telephone and telegraph signal system.

Rufus B. Richardson, who writes the article on "The New Olympian Games" in the September *Scribner's*, has been for a year the director of the American School at Athens. He describes the wonderful popularity which the American athletes gained with all classes of the Greeks, from king to peasant.

The August issue of the *Inland Printer* is a most interesting number. The numbers of this publication have an individuality highly creditable to the editorial and business management. Primarily a trade journal in the printing interest, the beauty of its typography and illustrations recommend it to the general public.

Artificial Diamonds.

M. Moissan, the distinguished French chemist, has discovered that if iron is saturated with carbon at the high temperatures of the electric furnace, some of the carbon, in cooling, will separate in the form of the true diamond. M. Rossel has shown that hard steel, owing to the methods of manufacture, contains diamonds, minute crystals being found when the steel is dissolved by acids.

Old Horse Cars as Summer Homes.

When the car horses throughout Connecticut cities were retired, a few years ago, with the coming of the trolley, people wondered what would become of the 600 cars that they had dragged so long, says the New York *Sun*. No one would have guessed then that a brisk demand for these old cars would spring up in one season and would almost completely exhaust the supply. Yet such has been the case this Summer.

The cars have been sold for Summer shelters in rural districts, for hunters' camps, for lodges by solitary lakes, for cabins on house boats, and, most of all, for the homes of campers on the coast of Long Island Sound and its islands. As a bicycle advertisement catch line reads, "you see them everywhere" this Summer.

All along the Sound beaches from Larchmont to Watch Hill, and even out on Block Island, these cars are found, poised on breezy bluffs, by purling brooks, and on shining sands, some as annexes to pretentious cottages. some strung together like a vestibuled train, some painted in the most fantastic hues, but all doing duty as efficiently as before the day when the car horse became extinct. The happy idea of using the cars for Summer camps has been so generally adopted that one finds a South Norwalk car unexpectedly confronting him at Black Rock Harbor, a lot of Waterbury and Bridgeport cars at Stratford and Merwin's Point, New Haven cars at Woodmont, Savin Rock and Morris Cove, Hartford and Middletown cars at Branford Point, Double Beach, Guilford and Saybrook, and Norwich cars and stages on the Thames River and on the Eastern Islands. So extensive has the demand become for cars that Station Agent Hayward, at the Union Station of the Consolidated road in this city, recently received a letter of inquiry from a woman inland, asking him for his lowest prices for passenger cars; also, for a list of styles.

A Norwich party at Scotchcap, on the Thames River, have arranged four horse cars in the form of a hollow square. A canvas awning covers the courtyard made by the cars, and a tall flagstaff rising from the center completes the pleasing establishment. One of the cars is used as a kitchen and workshop, and the others are lounging, sleeping and reception rooms.

Duncan De Wire, on Block Island, has five of the cars, arranged like the connected cars of a vestibule train.

A. K. Warren & Company Burned Out.

On August 11 the electrical repair shops of A. K. Warren & Company, 465 Greenwich street, New York city, were gutted by fire. William Gray, the company's superintendent, and two other men were burned to death and a number of others injured, some of them seriously. The firm occupied four of the six floors in the building. Their loss is estimated at $25,000; partly covered by insurance.

LIGHTNING ARRESTERS.

READ BEFORE THE NORTHWESTERN ELECTRICAL ASSOCIATION, MARINETTE, WIS., JULY 17, 1896, BY W. R. GARTON.

The subject of lightning arresters has received considerable attention from various sources, and we have, at the hands of many able gentlemen, been greatly enlightened, but, like many other subjects, there is yet room for expatiation.

We speak of lightning arresters in a general way, and in general look upon them as an inferior or minor piece of mechanism, to which not much importance is attached, and rarely do we stop to consider what a lightning arrester is, or the principles embodied therein that are noteworthy; therefore may we not ask ourselves, "What is a lightning arrester?"

The lightning arrester pure and simple is nothing more than a convenient path or outlet from the condenser or charged body to a point of lower or no potential. By this we mean that a certain body has, by contact or communication with a statically charged body (which may be air, wire or what not), become charged with the influence predominating the adjacent body, or, in other words, the originally charged body, which in this instance is the atmosphere, has given off to the conductor, which it surrounds, the same influence which pervades it, until the conductor has attained a high electric potential. Oftentimes the opposite conductor is far from being equally charged, and in this case a great strain is brought to bear on the insulation between the two sides of the circuit. To relieve this strain the little device known as the lightning arrester is used.

The simple and fundamental principle of the lightning arrester is the same as originally designed; viz., some form of an air gap with serrated or plain surfaces. The only changes made have been the addition of circuit-interrupting or arc-prohibiting features which the different currents employed have necessitated. The success or failure of lightning arresters in general can be attributed mainly to the successful or unsuccessful performance of the duties devolving upon these additional features. There have been very few of the numerous forms of lightning arresters devised which have not, in one form or another, employed the air gap.

The chief reason for the employment of the air gap, in preference to that of substituting some form of resistance, is that it is of variable resistance depending upon the conditions. Under ordinary circumstances it is a splendid insulator, but to a discharge it offers far less impedance than an artificial resistance of much less resistance.

Another great advantage is that it can instantaneously be restored to normal, and if once broken down and an arc established, its resistance is reduced to a minimum, whereas, before the disruption its insulating properties were sufficient to absolutely prohibit the flow or even a leakage of the normal current.

It is found also that the dynamic currents of high potentials will leap certain air gaps and permanently establish a flow. Thus we have to guard against the employment of too small an air gap and still not have it so large as to prohibit a free passage of the discharge. Having determined the proper and most advantageous air gap, we have yet another problem with which to baffle; that is, a means of automatically opening the lightning arrester circuit, should an arc be established.

At this point have we all come to a halt, and to span this chasm we have toiled and striven, and almost as numerous as are the ideas have been the different methods employed to accomplish the end. There are, however, a few which apparently have employed better methods than others and have been enabled to get very good results by the incorporating of their ideas into a desirable combination of principles.

One of the original ideas for accomplishing the desired effect was the addition of a fuse to that of the air gap, so that when the flow of current was established the fuse would be blown and in this manner the circuit restored to normal; but we were not satisfied with this form of an arrester, for we wanted something which did not require constant attention aside from being unreliable in case of discharges following in quick succession, and thus proving a constant source of annoyance.

The next step in advance was the increase in the number of fuses placed in multiple. Some inventors have employed a wedge or lever, which automatically comes in contact with each succeeding fuse after the blowing of the fuse with which it was in contact. But even this is unsatisfactory, because it requires constant care and attention, and must be carefully watched and regularly inspected. To overcome the annoyance of blown fuses and interrupted service, various methods have been employed. Among those best known is the "air-jet arrester," which automatically blows out the arc by a jet of air forced from a chamber in which an arc has been established in series with the outside arc. By the expansion caused by the heating of the air in the chamber, the air is given impetus, and when directed upon the arc it tends to blow it out. But even this form of arrester proved inadequate and unsatisfactory.

An early principle, and one which is recognized to-day as fundamental, is that of the magnetic blow-out, with which you are all familiar. Other and various forms have been used, such as the iron and mica washers, keystone, tank, etc., but in many of these forms either the mechanical portion has been a drawback or the construction was such as to render a barrier rather than an inducement to the discharge. Of the many forms mentioned, possibly it would be well to briefly look into the principles and construction of the form known as the tank.

This arrester is composed of a metal tank, or one comprising a metal lining. To this tank is connected a small pipe tapping the water main. This feed pipe may be placed at or near the bottom of one end of the tank; at the other end, and not far from the top, is another and large pipe for the overflow. By this means a constant flow of water can be maintained. On the top of the tank is arranged a rack which holds carbon points which penetrate the water. To each carbon point or set of points is attached a cord and plug. Every cord and plug represents a feeder.

Each feeder coming into the station is brought conveniently near the locality of the tank, or *vice versa*. In the vicinity of the tank, and inserted in each feeder, is a coil of wire equal in carrying capacity to that of the feeder; at the outer or line end of these coils is arranged a socket to fit the plug which is attached to the tank carbons.

Now, when the plug is inserted in the socket, the circuit is completed from line to ground through the water, which is in contact with the water mains through the feed pipe.

The principle of this arrester and its coils is, first, the coils offer a high inductive resistance to the discharge, while the tank offers an immediate outlet to earth. By this arrangement it will be seen that a high inductive resistance is inserted in the dynamo circuit, while a constant ground contact is open to the discharge preceding the high induction of the coils. It would seem impossible for the lightning to take any other than the ground course, and in most instances this is the case; but there have been cases where the discharge has passed by this ground through the coils and gone to earth through an air-gap arrester located in the switchboard, showing that an air gap is sometimes of greater inducement to the discharge than the path to earth through the water resistance, aside from the inductive resistance of the coils.

This arrester has in most instances proven very satisfactory. The two chief drawbacks are the constant consumption of energy while in circuit, and the possibility of a storm approaching without warning, and find you without your tank cut in; but if you are provided with a complete complement of automatic arresters to work in conjunction with your tank, your station need not suffer. I would state, however, that the tank arrester is used only on grounded or street railway circuits. Street railway and electric light managers have been, and are now, experimenting with the various forms of arresters in search of something which would protect their apparatus without having to be watched, and still be reliable. Many beautiful theories have been projected, and some of them put into working models, but, alas, nature's batteries have proven many of them but hypotheses, and thus we have been compelled to search farther.

I think that I may safely say that there are three forms of arresters being used to-day which are considered standard. They are the Wurts non-arcing, the General Electric magnetic blow-out and the Garton.

One thing will be noticed from careful inspection of these three forms; that is, that in the non-arcing and magnetic blow-outs different methods of construction are employed in dealing with the various currents, while in the Garton the same form and same principle enters into the arresters for all of the different currents.

There are two forms of the Wurts non-arcing arrester; viz., those for direct and those for alternating currents. The former interposes between the earth and circuit an extremely high ohmic resistance. So high is this resistance that current flow is prohibited, but it is calculated that to the static discharge no hindrance whatever is offered.

The non-arcing, direct-current arrester consists of a block of lignum-vitæ with metal terminals mortised into it at each end, so that the surface of the metal terminal or discharge blocks are flush with the surface of the lignum-vitæ block, thus leaving a space of about four inches between them. Several small streaks are charred across the surface of the lignum-vitæ from terminal to terminal, thus interposing a very high resistance, which forms the path for the discharge.

The non-arcing arrester for alternating currents is composed of cylinders of non-arcing metal, the surfaces of which are knurled. There are several peculiarities about this metal, and as thus far nothing but theories of its action have been projected, we may turn to that which exerts itself at the time of discharge an influence.

One thing very noticeable is that there is always left a black spot upon the cylinder at the point of discharge. Another peculiar thing is its inability to break an arc unless the air spaces are within certain limits. The explanation which has been given of this is that the influence exerted, whether gas or what not, is limited to certain distances and is of sufficient force outside of a certain field to counteract the power of the dynamo to maintain the arc.

The General Electric or Thomson idea is not to interpose a resistance so high that the current flow is absolutely prohibited, but the discharge points are placed in a powerful magnetic field, which is so proportioned that the current flow which would maintain the arc across the air gap makes the arc self-destroying, from the fact that it established a field sufficiently powerful to instantaneously destroy it.

In the Garton arrester the idea is to provide the best possible course for the discharge and to instantly cut off the current flow after the discharge. The chief aim in the construction of all lightning arresters is to offer the best possible path to the discharge and reduce the consumption of energy to a minimum.

In the construction of the Garton

arrester the following are some of the methods employed to accomplish this purpose.

As straight a path as possible with ohmic resistance reduces to a minimum and no inductive resistance at all, as the forms of all these various arresters are familiar to all. It is the purpose of this paper to deal with some of the principles involved and methods employed.

As is well known in the Garton arrester, that which prohibits the constant consumption of energy or the flow of normal current to earth is the employment of an air gap. After the discharge has leaped the air gap, and a flow is established, the small coil or solenoid becomes a magnetic field and the small plunger is suddenly drawn from its contact in the tube. The very act of drawing the plunger from its contact established in the circuit a secondary arc, which, being in series with the originally established arc, instantly interposes an additional resistance which goes on increasing by reason of its lengthening until the circuit is broken. Another means of destroying the arc is that of elongating it in the tube, which prohibits its assuming its natural form. The element of time also enters greatly into this device from the fact of its being mechanical in its operation.

It will be seen from the foregoing that there are two principles which enter into the make-up of a lightning arrester, and those are the flow-prohibiting or breaking elements, whether electrical or mechanical, and the form of discharge path, whether air gap or artificial resistance. There are some people who, it would seem, expect lightning arresters to perform miracles, but thus far we can not attribute to these devices any such.

Why are lightning arresters used, and why can we not get along without them? For the same reason that we can not do without the fuse or circuit-breaker; they are a necessity. Nor can a circuit be safely operated in this climate without lightning arresters, any more than it is possible to operate a large plant over the same copper circuit that we would operate one of half its capacity. But, to come squarely to the question, why do we use lightning arresters? We may answer this question in brief by saying, As a means of protection to our apparatus against the disruptive discharge. But to this reply we might say, They do not protect.

True it is that in many instances lightning arresters have not proven a source of protection, but in nearly every instance, providing the device is within reasonable bounds of perfection and involves correct principles, it will be found that somewhere in the installation the fault lies, and not in the apparatus, which is generally the first to be condemned.

It is very often the case that such devices are put in position in a hurry, without selecting the best locality with regard to prevailing conditions. While it is true that the existence of nodal points is a great factor, it is always wise to choose the locality for the placing of arresters. After having chosen what, in the best judgment, would be the best points for the arresters, there should be a liberal number scattered through the entire system to make sure of having some arresters at discharge points. This may seem like a wholly one-sided argument in favor of the manufacturer, but it is not at all so, for a goodly number of arresters can be purchased for far less than the expense of repairing burned-out apparatus or the loss of interrupted service, and it is reasonable to suppose that a circuit equipped with a sufficient and reasonable number of good arresters would prove the investment a good one. Trouble invariably occurs in circuits which are inadequately equipped. No station, whether direct or alternating, should be operated without the insertion into every feeder of a choking or kicking coil in conjunction with the lightning arrester. This applies to street railways as well as stationary motors, but it is not necessary on series arc circuits.

A kicking coil properly constructed is of vital importance, as it offers a very high inductive resistance which is a most formidable barrier to lightning.

Another thing which should never be forgotten when equipping a circuit with arresters is that every terminal shall be provided with an arrester, for invariably very heavy discharges occur at the terminals. This rule can be applied to any and all circuits. Different circuits require different localities for the installation of arresters, as, for instance, on railway circuits, we equip each car and station feeder and scatter them along the line at varying intervals from one-half to one mile apart, and at the terminals, while on alternating circuits we place arresters at the individual transformers or banks. But there is one thing that should not be tolerated, and that is to make a lightning arrester a part of or in any way connected with a transformer. It should be the purpose to keep the lightning just as far from the transformers as possible. Although of high inductive resistance it can very rarely ward off disruption unless it is supported by some good lightning arrester. It has been the spirit of this paper to draw comparisons only where it has been found necessary to show the true principles and bring to light and illustrate more clearly the elements necessary for successful attainments.

Auburn, Ind., Telephone Company.

The Auburn, Ind., Telephone Company has completed its organization and elected the following officers: Geo. W. Beers, president; John L. Davis, treasurer, and Chas. Bash, secretary. These, with F. T. Zimmerman, W. H. McIntyre, C. S. Snyder and H. C. Paul, constitute the board of directors. The Central Union Telephone Company has also started an exchange at Auburn, but its list of subscribers is not as large as that of the Auburn Telephone Company. What a town the size of Auburn will do with two competing telephone exchanges remains to be seen.

DELETERIOUS EFFECTS OF X RAYS ON THE HUMAN BODY.

FURTHER EVIDENCE THAT REPEATED EXPOSURE TO THE RAYS PRODUCES A SUNBURN EFFECT.

To the Editor of Electrical Review:

This week's issue of the Electrical Review, just received, contains an article on the "Deleterious Effects of X Rays on the Human Body." Mr. Hawks's conclusions as to the cause of his trouble are without doubt correct. Mr. K., who attends to the testing of the tubes during and after the exhausting process at our work rooms, complained a few weeks ago of a peculiar itching and burning in his left hand, and thought that it was caused by poisoning with chemicals. The skin assumed a dark red color; it became hard and glossy, and finally began to peel off. There was a sort of dead feeling in the finger nails, "as if pounded with a hammer." The trouble could neither be traced to chemicals nor to any other known source, and we finally concluded it must be the effect of the rays. A burning of the eyes has also been noticed, not to such an extent, however, as described by Mr. Hawks. Within a week past the same phenomenon has appeared on my hand. The skin has turned brown and hard, and during last night a blister about three-eighths of an inch in diameter was raised on the little finger. Further developments will be carefully watched and noted.

The above effects have only been noticed since we began the manufacture of the "Bowdoin College" type of tubes in quantities. This being a very powerful tube undoubtedly increases the deleterious effects upon the system.

Yours very truly,

G. A. Frei.

Boston, August 13.

ELECTRIC RAILWAY NOTES.

The General Electric Company has secured a temporary injunction restraining the Walker company, of Cleveland, from making or using certain improvements in suspended switches and traveling contacts for electric railways.

The gross earnings of the Hingham, Mass., Street Railway Company for July amounted to $9,800; net earnings, $5,700. Net earnings for June amounted to $2,000, although the road was in operation practically only two weeks in June. As the fixed charges of this road for the year amount to but $6,250, it will be seen that in six weeks' operation fixed charges for the year have been earned.

In the matter of the foreclosure and sale of the $500,000 mortgage of the State Trust Company against the Syracuse, N. Y., Street Railway Company, agreement has been made to adjourn the next hearing and closing argument to Camp Barrow on Skaneateles Lake. This is the Summer cottage of Attorney George Barrow, of Skaneateles, who is the referee in the case. The sale has already been ordered for August 26.

The village board of trustees of Oneonta, N. Y., at a meeting on August 10 granted a permit to the street railway company to extend their lines on a number of new streets and to erect poles and wires necessary to equip an electric road. It is understood the change will be made and extensions built this season. The extension of the line to Richfield Springs is also contemplated. The new company is to have a capital stock of $250,000.

A director of the West End Street Railway Company, of Boston, is quoted as saying: "During the month of July the West End road carried more passengers than during the same month last year, notwithstanding the fact that the fourth of July and the first Sunday in July were rainy, and that in July a year ago 50,000 visitors were in Boston attending the Christian Endeavor Convention. August, so far, is ahead of last year as to number of passengers carried, and, owing to the hot weather, promises to far exceed the corresponding month a year ago."

According to a Wall street paper, a gentleman who has just gone over the Metropolitan system on Lenox avenue, New York, says that the underground trolley is giving satisfaction in every respect but one, and that is, at times the car is apt to lose its connection with the wire, and the motorman has much trouble in regaining the connection. Aside from that difficulty, the underground trolley is pronounced a success by those who use it. Nevertheless, some of the directors of the company are impressed with the possibilities of air motors, and have put a good deal of money into the development of this motor and are anxious to have Metropolitan Traction give it a thorough test before making any further changes. This test at present is largely to determine the relative cost of the different powers.

A New Marine Signaling Device.

The United States Consul at Copenhagen, Denmark, reports to the State Department that a young boatswain in the Danish navy has invented a telegraphic apparatus for communication with a ship at a certain anchorage without the use of a direct line. An electric battery, with one pole in contact with moist earth at one end and a telegraphic key and interpreter at the other, constitute the Bland apparatus, from which a cable is laid to and around the anchorage in a coil from 1,000 to 1,200 feet in diameter. A solenoid connected with a telephone aboard the ship completes the apparatus. The plan has worked successfully, and the young inventor is now at work to get rid of the telegraph key and make the communication wholly telephonic. Among the advantages of the new method is that signals made in this manner will not be visible to an enemy, as in case of flags, and that ships moving near the shore can communicate with stations while passing over certain spots before designated.

ADVANCE INFORMATION

Valuable News and Tips for Manufacturers and Dealers.

We publish below information relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW.

New Telephone and Telegraph Companies.

WARRENVILLE, CT.—The Southern New England Telephone Company have bought the Western Union telegraph line, and the wires are removed with the exception of three which are left for the use of the telephone company. Their line has been extended from Atwoodville to this place to connect with the lines from Hartford to Putnam.

PADUCAH, KY.—The Postal Telegraph Company has been granted a franchise by the council to operate a telegraph system here.

KEENE, N. H.—The New England Telephone Company's linemen are putting up a metallic circuit to improve the telephone service between this place and Marlboro.

DES MOINES, IOWA—It is said that contracts have been let for a toll line telephone system by which Perry, Herndon, Fonda, Fort Dodge, Webster City, Boone, Sioux City, Algona, Mason City, Clear Lake and a lot of other towns will be connected with this place. The system will be put in by mutual companies and operated independent of the Bell system.

MUSKEGON, MICH. — A 30-year franchise has been granted to the Citizens' Telephone Company to put in an exchange and supply 'phones at $18 and $24 per year for residences and business places. The officers of the company are: President, Peter C. Burns, of Kokomo; vice-president, Charles H. Hackley; treasurer, L. B. Smith; secretary, Hugh Park. The exchange will be installed by October 1, and a State line will be in between Grand Rapids and Muskegon by November 1. The new company will start with 400 subscribers.

CEDAR RAPIDS, IOWA—The Cedar Rapids & Marion Telephone Company filed articles of incorporation with the Secretary of State. The object of the corporation is to construct and operate a telephone in and between the cities of Cedar Rapids and Marion. The capital stock is $50,000. The incorporators are William P. Daniels, E. E. Clark, T. S. Metcalf, Lewis Heins and R. O. Simmons.

PETERBORO, N. H.—The matter of building a telephone line from this place to Antrim is now being considered by the New England Telephone and Telegraph Company.

BALTIMORE, MD.—The Standard Telephone Company has been incorporated by Thomas S. Hodson, Chas. O. Cooper, Edward S. Kines, J. Tiers Reardon and William F. Beiswanger, with a capital stock of $15,000. The company will construct and operate telegraph and telephone lines in Maryland.

BRANFORD, CT. — The Southern New England Telephone Company has purchased a lot on Wilford avenue, upon which it expects to erect a building for exchange purposes and a test station for the trunk line.

CARTHAGE, N. Y.—The Central New York Telephone and Telegraph Company will extend its line from this place to Star Lake.

New Electric Railways.

DENVER, COLO. — An ordinance granting a franchise to the Denver, Globeville & Golden Rapid Transit Company has been passed.

BROOKLYN, N. Y.—The Brooklyn, Newtown, Jamaica & Flushing Railroad Company is preparing to operate an electric railroad from Brooklyn to Jamaica.

BALTIMORE, MD. — The Central Street Railway Company, of which George Blakistone is president, will use compressed air as a motive power. This system is working successfully in Europe and New York. It will do away with poles and overhead wires, and make less noise.

WORCESTER, MASS.—T. C. Bates is interested in the proposed electric railway from this city to Clinton. It is reported that construction will commence in the Fall.

BALTIMORE, MD.—The Baltimore Traction; improvements being made in the railway system.

MINNEAPOLIS, MINN. — W. T. Moore has applied for permission to construct and operate a scenic railway at Lake Harriet.

KANSAS CITY, MO.—The North End Improvement Association held a meeting recently in the interest of granting a street railway franchise on Wyandotte street.

BRENHEIM, TEX.—Major Abe Harrison can be addressed in regard to an electric railroad belt line.

MADISON, IND. — The Madison Light and Street Railway Company has been incorporated by John S. Ward, John Sutherland, Lewis J. Highland, Charles Fifer and George Everrod. Capital stock, $75,000.

NEW CASTLE, PA.—The New Castle & Mahoning Street Railway Company has been incorporated, with De Witt Dilworth president, to build an electric railway.

HAMBURG, N. Y.—The Buffalo, Orchard Heights & Hamburg Electric Railway Company has been organized by M. W. Wheatley, New York; A. W. Hickman, I. W. Allen, U. L. Upson, and others, to build an electric line from Buffalo to Hamburg. Capital stock, $120,000.

NORTH ADAMS, MASS.—The Hoosac Valley Street Railroad has petitioned for the extension of its electric railway.

Electric Light and Power.

WEST NEWTON, PA.—An ordinance authorizing an election on a proposition to issue $14,500 of six per cent bonds to increase the capacity of the electric light plant has been passed.

TROY, MO.—A movement is on foot to establish an electric light plant at either this place or Moscow Mills, and to connect the two towns by an electric railway.

CHATFIELD, MINN.—C. P. Madison has been granted a 20-year electric light franchise, the city to have option of purchasing at the end of 10 years. The plant will be in operation by January 1. It will be run by water power at Madison's mill.

CUMBERLAND, MD.—An ordinance has been introduced authorizing the question of erecting an independent electric light plant, to be owned by the city, at a cost not exceeding $20,000, to be submitted to the voters of the city at the next annual election in May, 1897.

YORK, PA.—The Leber Electric Company has made application to the Town Council of Littlestown for permission to erect and operate an electric plant for furnishing light to the town. An ordinance granting the privilege to the company has been brought up before the council.

CHICAGO, ILL.—Marquetter Electric Company has been incorporated; capital stock, $2,500. Incorporators Edwin O. Lanphere, Henry J. Brubaker and Ripley N. Baylis.

ALBERT LEA, MINN.—D. M. Dominick has been awarded contract for the construction of new $10,000 building for the electric light company.

PARK CITY, UTAH—M. H. Quirk has been granted franchise for an electric light plant.

KINSTON, N. C.—Steps are being taken to erect an electric light plant.

PITTSFIELD, ME.—It is now probable that this place will be lighted by electricity in the near future. The Board of Trade has been negotiating with parties to put in an electric plant. It is proposed to establish a large machine shop in connection with the electric light plant.

GREENSBURG, PA. — The West Newton Council has ordered a special election on a proposal to issue $14,500 of bonds for the enlargement of the electric light plant.

ORANGE, N. J. — Ground was broken last week for the new electric light station of the People's Light and Power Company, which has just secured the street-lighting contract for the city of Orange.

NEWARK, N. J.—The Consumers' Electric Light and Power Company has been incorporated by Benjamin Atha, Albert O. Headly, Edward L. Conklin, of Newark, and Thomas C. Barr, of Orange, N. J. Capital stock, $300,000.

MONTICELLO, WIS.—There is no doubt that this village will have an electric light plant soon. A franchise will be granted to a home firm.

New Manufacturing Companies.

NEW YORK, N. Y.—The Midland Electrical Company has been incorporated to manufacture and deal in electrical apparatus and appurtenances pertaining to "Royal Dry Battery."

CHICAGO, ILL.—Safford & Moore Railway Jack Company has been incorporated by James B. Safford, Moses M. Moore and Nathan W. Williams. Capital stock, $100,000.

NEW YORK, N. Y.—The Coleman Call and Signal Company has been incorporated to maintain and operate electrical wires for signal and call purposes; capital, $3,000; and directors, Daniel Coleman, John Coleman and John Coleman, Jr., of New York city.

WESTBROOK, ME.—The Dow Portable Electric Assistant Company has been organized for the purpose of manufacturing and doing general business in the Dow Portable Electric Assistant and other electrical instruments, with $100,000 capital stock, of which nothing is paid in. The officers are: President, George Warren Wheeler, of Braintree, Mass.; treasurer, William E. Dow, of Braintree.

Increase of Capital.

ST. PAUL, MINN.—The Albert Lea Electric Company has increased its capital stock to $50,000.

BRIDGEPORT, CT. — The capital stock of the Bryant Electric Company has been increased from $50,000 to $75,000 and the number of shares from 2,000 to 3,000.

CINCINNATI, OHIO—The Cincinnati Street Railway yesterday made a heavy increase of its capital stock, which was already $11,000,000. By the certificate of increase recently agreed upon, and filed yesterday with the Secretary of State, the stock is increased to $18,000,000.

CLAREMONT, N. H.—The Claremont Electric Light Company has increased its capital from $12,000 to $20,000, and applied it to improving its plant.

Business Troubles.

NEW YORK, N. Y. — American Railway Electric Light Company; attachment for $4,010 issued against them, in favor of John B. Kearny.

ALTOONA, PA.—The Phœnix Telephone Company, operating lines throughout this section of Pennsylvania, have failed. Depression in business is said to be the reason of the failure. The assets of the company are $15,000, liabilities unknown.

JACKSONVILLE, FLA.—A. F. Perry has been appointed receiver of the plant of the Jacksonville Electric Light Company.

NORFOLK, VA.—The Southern Electrical Construction and Supply Company has made an assignment.

The Electric Appliance Company, of Chicago, were very successful on large deals during the month of July, closing an unusual number of orders for complete electric supply equipments for several good sized plants. They also state that the general volume of business for the month was reasonably satisfactory, considering the time of the year and the general condition of trade.

The Eureka Tempered Copper Company, of North East, Pa., is going through a reorganization. The company's personal property was sold on August 6 to the Second National Bank, of Erie, Pa., and the real estate will be sold by the company's creditors on September 7. After that the reorganization will be completed. In the mean time Mr. Alfred Short is managing the company, as trustee for the Erie bank, and is giving his special attention to filling all orders promptly and carefully.

X-Ray Apparatus.—Investigators and others practically interested in X-ray work will without doubt be greatly interested in noting the appearance of a large and responsible concern as manufacturers of all kinds of X-ray apparatus. As will be seen in our advertising columns, the Edison Decorative and Miniature Lamp Department (General Electric Company), Harrison, N. J., is in the field with an entire line of X-ray apparatus of all kinds. The name of this concern alone is sufficient guarantee of the completeness and efficiency of any apparatus that it may put out, having at its command the services of the most thorough expert in the country in its various branches. We hope to be able to present to our readers shortly some further description of the apparatus which is now being made and extensively sold by the above concern.

Transportation to the National Encampment of the G. A. R.—Colonel J. S. Graham, department commander of the Grand Army of the Republic, State of New York, has selected the West Shore Railroad as the official route for delegates and their friends who will attend the National Encampment of the Grand Army of the Republic at St. Paul, Minn., September 1 to 4. A special train, consisting of eight elegant Wagner sleeping cars and coaches, will leave New York Saturday, August 29, at 9 A. M., stopping at principal stations throughout the State, and running through to St. Paul without change. Veterans, sons of veterans, and parties desiring to participate in this encampment can take advantage of the special arrangements made by Commander Graham with the West Shore Railroad. A very low rate of one fare for the round trip has been made from all points to St. Paul and return. A very handsome colored circular, giving full information, can be had upon application to any West Shore ticket agent.

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Proposals for Underground Cables.

Office Board of Fire Trustees,
CINCINNATI, OHIO, August 10, 1896.

SEALED PROPOSALS will be received by the Board of Fire Trustees of the city of Cincinnati, at its headquarters, Sixth street, near Vine, Cincinnati, Ohio, until 12 o'clock noon, September 10, 1896, for the manufacture, delivery and installation of underground cables for the electric circuits of the Fire Department, according to plans and specifications now on file in the office of Thos. F. Clohesy, electrical engineer, Room No. 38, Pike Building, Cincinnati, Ohio.

All proposals must be addressed to the president of the Board of Fire Trustees and indorsed "Proposals for Underground Cables."

Each bid must be accompanied by a certified check on a Cincinnati National Bank in the sum of $500 as a guarantee that the bidder will enter into a contract for the work and furnish the required bonds if the contract is awarded to him.

The Board reserves the right to reject any or all bids.

By order of the Board.

D. W. SHEDD, Secretary.

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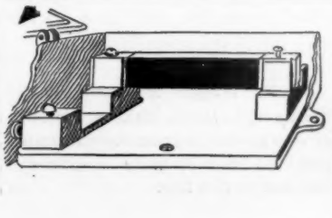
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Utica Electrical Manufacturing and Supply Co., UTICA, N. Y.

ELECTRICAL PATENTS

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED AUGUST 11, 1896.

565,453 Electric railway; W. Grunow, Jr., Bridgeport, Ct.—The combination in a closed conduit for electric railways, the bottom of which is filled in with asphaltum, the upper surface of which is inclined to form a gutter, of an electrical conductor supported centrally in said conduit, and insulated therefrom and a flexible curved cover for said conduit, a depressible rail disposed between said elastic cover and insulated therefrom.

565,529 Dynamo-electric machine; E. Caemmerer and F. G. Mayer, Chicago, Ill.—In a dynamo-electric machine, a field magnet comprising a core provided with pole-shoes, a sleeve adapted to contain said core and having an equal number of pole-shoes therewith, and non-magnetic material interposed between said pole-shoes of said core and said sleeve whereby the magnetic lines of force generated in said core will be caused to pass through the armatures before completing the circuit through said sleeve.

565,530 Dynamo-electric machine; E. Caemmerer and F. G. Mayer, Chicago, Ill.—In a dynamo-electric machine, a field magnet comprising an outer casing, and a core situated within said casing and supported upon non-magnetic supports.

565,541 Socket for incandescent lamps; H. Hubbell, Bridgeport, Ct.

565,574 Electric heater; R. V. R. Sill, Cleveland, Ohio—The combination of a hermetically sealed radiator having vertical chambers communicating with each other at their upper ends, a comminuted resistance filling said radiator, and an electrode extending into the lower end of each chamber and having contact with the resistance material.

565,576 Method of manufacturing incandescent lamps; F. S. Smith, Pittsburgh, Pa., and J. A. Vandegrift, Allegheny, Pa.—Consists in passing the assembled parts through a body of heated gas having a progressively increasing temperature from the ends to the middle or fusing portion, and at the same time shielding the bulbs, whereby the exposed parts become fused together and then annealed.

565,624 Electric conduit railway; J. B. Linn, Cleveland, Ohio—In electric railways, a wooden box constructed to be filled with oil and located at the side of the track and having double ends, and a contact block in each end provided with spring contact points and a switch in said box.

565,627 Telephone exchange system; A. F. W. Meyer, Blue Island, Ill.—The combination with the switchboard, the contact-plugs thereof and the wires connecting the subscribers' lines with said plugs, of conducting levers bearing toward their free ends on said wires to hold them separate and taut and forming electrical connections between said lines and connecting wires.

565,647 Armature for dynamo-electric machines; D. P. Thomson and A. H. Armstrong, Schenectady, N. Y.—Comprises a core having slots the sides of which are parallel with the radii passing through their centers, L-shaped teeth having undercut portions, coils each occupying an aliquot portion of the slot, and wedges engaging with the undercut portion of the teeth for retaining the coils in place.

565,662 Electric switch; C. Bach, Jr., Milwaukee, Wis.—A knife-switch blade having a handle in pivotal connection therewith, a slotted handle engaging bracket provided with a forwardly extended foot, and a spiral spring connecting the handle with the bracket foot.

565,673 Electric switch; W. L. Denio, Rochester, N. Y.

ITEMS OF INTEREST.

It is reported that the Cincinnati Edison Company will build a new and modern station on the river bank and use its present plant near the City Hall as a distributing station.

The earnings of the Columbus, Ohio, Street Railway for July were as follows:

	1896	1895	Inc.
Gross....	$56,112	$55,898	$214
Net	29,914	28,380	1,533

A Diver Gets a Submarine Shock.

The truthfulness of the old saying that one never can tell where lightning is going to strike is proved by an accident which happened to a man while standing on the bottom of the Willamette, in a diver's suit of armor, a few days since, says the Portland *Oregonian*. The City and Suburban Railway Company has a power house near Inman & Poulson's mill, from which the electricity is conveyed by a submarine cable across the river to operate some of its lines on the west side. A short time since the Union power house, from which some of the company's lines were operated, was burned, and, as misfortune never comes singly, a day or two since the cable which crosses the river to the foot of Jefferson street failed in its duty.

J. F. Kelley, superintendent of the power plant on the east side, took steps to ascertain what the trouble was and to have it put to rights. He sent Billy Martin, the company's diver, down to overhaul the cable, which was found to have sustained a fracture, and the copper wire in the center, which is the conductor, had in some way got in contact with the wire covering which protects the outside of the cable. The power had been shut off from the cable at the power house before the diver went down, and all concerned supposed he would have "dead wire" to handle.

They forgot about the "back water" current from the Third street trolley wire, which kept that part of the cable west of the break charged and very much "alive." In bending his head down close to the cable to examine the break, for the light was dim down there, the metallic fixtures on the diver's helmet touched the charged end of it, and he received a shock which nearly knocked him insensible. He signalled "up" as quick as he could, and when hauled to the surface expressed a strong desire to stay there.

He had been surprised as well as shocked, and he wanted to quit work there and then, as it was not in his contract to have live wires applied to his "headpiece." He was remonstrated with and assured that he must be mistaken; that it was impossible he could have been shocked by electricity, because the power was shut off at the power house. He was finally persuaded that the shock was due to the imagination, or something of the sort, and his helmet being put on, down he went again. Before he could fairly see what he was about he was shocked again in the same manner, and came to the surface, if possible, quicker and madder than before. Finally some one thought of shutting off the power from the Third street line, and the cable was soon raised and properly repaired.

P. R. Wagor & Company, of Springfield, Mass., make a specialty of wire guards for incandescent lamps, and have built up quite an extensive business in this line.

KIND WORDS.

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To the Editor of Electrical Review:

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Very truly yours,

Y. M. C. A.

August 6.

The earnings for July of the Edison Electric Illuminating Company of New York, including the high-tension systems, were as follows:

	1896.	1895.	Increase.
Gross,	$156,891.32	$135,693.59	$21,197.73
Net,	67,270.56	58,533.59	8,736.97
Gross, 7 months,	$1,262,795.96	$1,151,641.78	$111,154.18
Net, 7 months,	611,803.55	549,535.91	62,267.64

PATENTS.

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References: "Electrical Review," New York; Paul Cromlein, Teller Lincoln National Bank, Washington, D. C.; Judge Geo. D. Parker, Berkley, Va.; Second National Bank, Washington, D. C.; E. K. Leech, U. S. Mint, Philadelphia, Pa.; W. F. Newell, Manager and Secretary Water Works, Olympia, Oregon.

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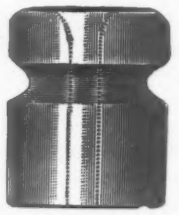

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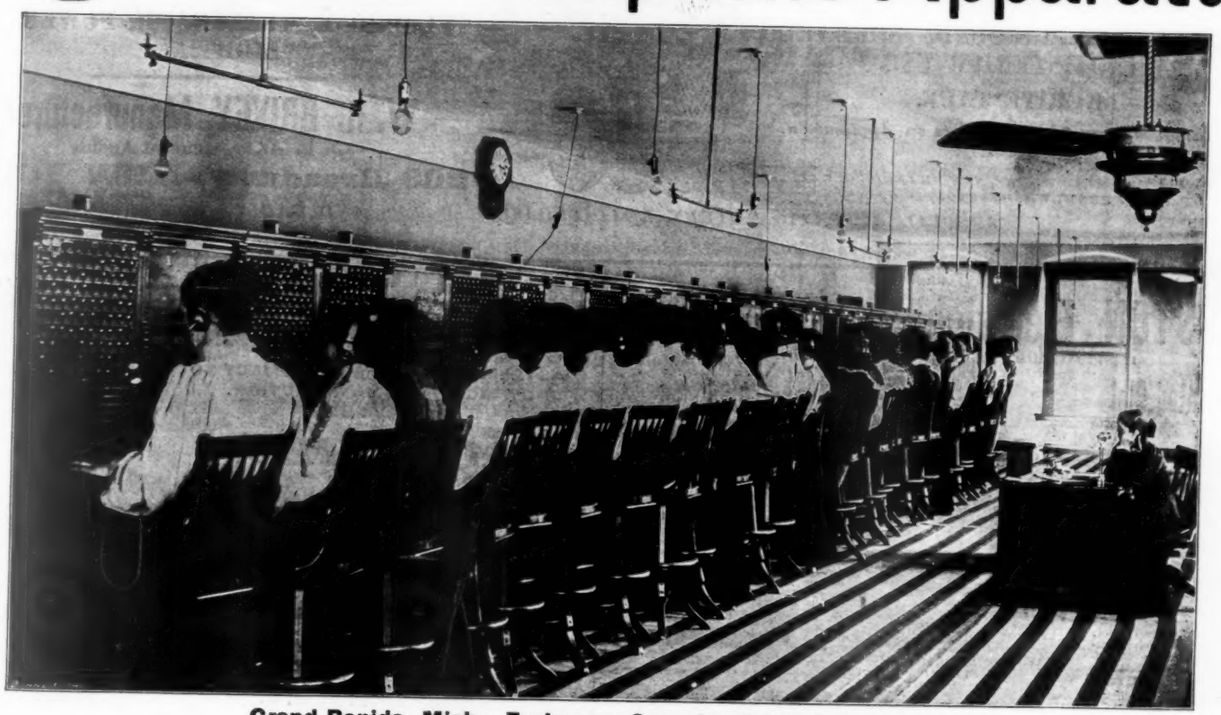

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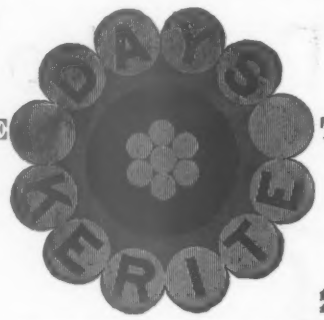

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